# Stealing the Past:

# Disputed Memories in Twins

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A thesis

submitted in partial fulfilment of

the rquirements for the Degree

of

Doctor of Philosophy

in the

University of Canterbury

By

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University of Canterbury
2002

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# Abstract

This thesis investigated a new false memory phenomenon: disputed memories, in which two people dispute ownership of a memory. For example, in one case two twins recalled being sent home from school for wearing too short a skirt although only one of them was actually sent home. The first study compared twins' ratings of disputed and non-disputed memories and found that disputed memories were rated significantly higher on a number of phenomenological properties thought to be central to recollection. Study 2 used the cue-word technique in an attempt to elicit disputed memories in a naturalistic way. Twenty sets of twins disputed a total of thirty-six events, twenty-one of which were only discovered to be in dispute during the study. In the third study non-twins were asked whether they had every experienced a disputed memory. The results suggest that they do but at a lower frequency than twins, with six of the sixty-nine participants reporting one disputed memory. Study 4 asked parents to provide brief descriptions of events from the lives of their twins to examine whether the participants would claim their co-twin's events as their own. The results suggest that they sometimes do, with two disputed memories reported from six sets of twins, but the method was somewhat unreliable as parents attributed some events to the incorrect twin. In Study 5 six sets of twins who took part in Study 1 were asked to re-rate their disputed and non-disputed memories after a two-year delay. The results suggested that disputed memories may have some quality that renders them less susceptible to decay over time as ratings for disputed memories on all of the scales remained relatively stable whilst ratings for non-disputed memories were significantly lower on re-test. Overall, results from the five studies suggest that disputed memories represent a new kind of confabulation that is relatively common amongst twins. A number of existing theories of autobiographical memory, such as source monitoring, unconscious plagiarism and imagination inflation, offer some insight as to what factors may be involved in their creation.

# Chapter 1

# Autobiographical Memory in Twins

## 1.1 Introduction

Our autobiographical memories define who we are and tie us to our personal histories. They are the set of stories and memories that contain the chronicles of our existence. Autobiographical memories are important for many reasons, but the most significant is that they tell us who we are. Imagine then what it is like when someone else claims your personal memories as their own. Personal and anecdotal evidence suggested that the ownership of memories is sometimes disputed by twins and the aim of this dissertation was the investigation of this phenomenon.

Previous work in the area of autobiographical has addressed its nature for past events in individuals. The current thesis addressed autobiographical memory in the case of twins and concentrated on the phenomenon of twins sharing the same recollection of an event but differing as to which twin the memory legitimately belonged. No base-rate data was available from which to judge the frequency of this phenomenon but considerable anecdotal evidence from twins suggested that this was not an unusual occurrence amongst them. When contemplating the beginning of this research I conducted an informal poll and six out of seven twins reported having experienced disputes over memories at one time or another. In one case both twins recalled being sent home from school for wearing too short a skirt but only one of them was actually sent home. This research, therefore, endeavored to analyze the factors that contributed to such occurrences among twins and whether they also occur with other types of siblings. These memories were called disputed memories. As the disputed memories that were the focus of this research were all autobiographical, I begin by reviewing this area.

## 1.2 What is Autobiographical Memory?

Autobiographical memory, according to Tulving (1972), is concerned with how

people remember personal experiences and events from their past. Tulving proposed that it comprised two distinct components: episodic and semantic memory. Semantic memory consists of information about states of the world and is stored in declarative form, e.g., "London is the capital of England", or "restaurants have waiters". Episodic memories are context-bound and relate to situations where a person remembers an experienced event which contains spatio-temporal knowledge (i.e., details of time and place) (Conway, 1996). These components of autobiographical memory, episodic and semantic memory, though fundamentally different, are inextricably linked. Tulving (1985) suggested that episodic memory was embedded within semantic memory and that continual top-down and bottom-up processing exists between them. Semantic knowledge helps people to interpret both everyday and novel situations. For example, if a person were visiting a Japanese restaurant for the first time his or her semantic knowledge of restaurants generally would supply the necessary coping behavior and create expectations in the novel situation. Then, the knowledge gained during that episode would, in turn, become embedded within that person's semantic memory about restaurants (e.g. Japanese restaurants have chopsticks).

In a further development to his theory of autobiographical memory, Tulving (1985) suggested that a third component to autobiographical memory existed in the form of procedural memory. A distinction previously put forward by philosophers such as Broad (1925), procedural memory relates to automatic behaviour that is performed without conscious thought as in riding a bike or reading a book. In 1991, Tulving again refined his theory and proposed that autobiographical memory comprised five separate components: procedural memory, perceptual memory, short-term memory, semantic memory and episodic memory.

Many researchers have debated the nature of autobiographical memory (Brewer, 1996; Conway, 1990; Robinson, 1996) and have proposed differing definitions. Brewer contended that it referred to recollective memory only, stating it is "a recollection of a particular episode from an individual's past" (1996, p. 31) whilst others regard it as

including larger kinds of memories about the self or relating to factual memories about the self (Rubin, 1986), for example, knowing where you were born or went to school.

There has been substantial confusion over attempts to formally define the term when discussing autobiographical memory. It has been referred to as "true memory" (Furlong, 1951), "event memory" (Smith, 1952), "retrospective memory" (Ayer, 1956), "personal memory" (Locke, 1971), "memory for real-world events" (Linton, 1975), "personal real-world episodic memory" (Linton, 1978), memory for unique personal events" (Thompson, 1982), "picture memory" (Lacey, 1989), "recollection" (Baddeley, 1992; Rubin, 1998), "personal memory" (Brewer, 1986) and "recollective memory" (Brewer, 1996). The confusion over what terminology is most appropriate is compounded by the ambiguity about what memory phenomena the terms are meant to cover (Brewer, 1996). In his attempt to establish "recollective memory" as the technical term used to refer to autobiographical memory Brewer, (1996) referred to research carried out by Robinson in 1976 using the cue word technique to elicit memories. Robinson asked participants to come up with an autobiographical memory to cue words and when they responded with factual or generic information he further prompted them for a specific memory. Brewer claimed that this prompting for a specific memory suggested that Robinson's research was focused not on autobiographical memory per se, which include larger classes of memories such as facts about the self, but specifically on recollective memory.

This debate poses the important question: are autobiographical memories different from other memories and do they belong to a distinct memory system? If so, what kinds of memories belong in this system? Does knowing how to drive a car, for instance, qualify as an example of autobiographical memory? There is obviously a qualitative difference between *remembering* how to drive a car (Tulving's procedural memory) and remembering the first time you drove a car (Tulving's episodic memory), but does this difference mean these two types of knowledge belong to separate systems? Some researchers consider all memories for events and personal experiences are autobiographical (Banaji & Crowder, 1989). Other researchers assert that autobiographical

memory is a particular type of memory involving remembering a particular episode from the past. In this view autobiographical memories contain information that is self-referenced, context and time specific and include sensory and perceptual details. Further, recalling the event involves a partial reliving of the original event, giving the rememberer a conscious feeling of a prior experience, a term which Tulving called autoneotic consciousness (Tulving, 1985).

### 1.3 Historical Overview of Autobiographical Memory: The Early Theorists

Although Tulving, in the early 1970's, was one of the first psychologists to propose a theoretical underpinning of autobiographical memory much of the early research on autobiographical memory was carried out in the late 1800's and early 1900's. This research was performed by both philosophers and psychologists and the work of some of the more influential of them has been very well reviewed by Conway (1990). The following is a summary of some material covered in that review.

#### Francis Galton

Francis Galton (1880) was the first scholar to make autobiographical memory the focus of systematic empirical research and as such was a pioneer in his field. Galton was interested in the variety of memories he held and created a unique method of examining them. The procedure he used, which he described below, was to concentrate on either a word or an object and count the number of memories that were elicited.

> My method consists in allowing the mind to play freely for a brief period, until a couple or so ideas have passed through it, and then, while the traces or echoes of those ideas have passed through it, and then, while the traces or echoes of those ideas are still lingering in the brain, to turn the attention upon them with a complete and sudden awakening; to arrest, to scrutinize them and to record their exact appearance. Afterwards I collate the records at leisure, and discuss them, and draw conclusions. It must be understood that the second of the two ideas was never derived from the first, but was always directly from the original object. This was ensured by absolutely withstanding all temptation to reverie (Galton, 1880, p. 185).

Galton was surprised at the diversity of his memories stating "samples of my whole life had passed before me..." (p. 187). Buoyed by his initial success Galton attempted to record the contents of his memory by recording his recollections to a number of cue-words. The number of new memories elicited in each of the four trials declined steadily leading him to conclude that his memory was not as diverse at it had originally appeared.

Galton conducted a further study in 1880 which involved distributing questionnaires to participants and directing them to recall and describe their breakfast table from that morning. In retrospect, this work was of considerable importance as it was the first time individual differences in visual imagery was seen as being an important component to remembering (Brewer, 1986). Indeed since Galton's early work there has been growing appreciation and interest in the role that visual imagery plays in autobiographical memory (Brewer, 1996; Rubin, 1998). Galton's early work has had a direct impact on autobiographical memory research and both of his methods, the cue-word technique and directed recall, are still widely used in the modern study of autobiographical memory.

**Hermann Ebbinghaus**

Although carried out during the same era, Ebbinghaus's approach to the experimental study of memory was in direct contrast to Francis Galton's. Ebbinghaus explicitly rejected the study of personal memory and proposed that to accurately test rates of forgetting the influence of prior knowledge had to be minimised (Ebbinghaus, 1885). He therefore avoided the use of meaningful stimuli and instead used nonsense syllables and strings of numbers as the material to be remembered. Ebbinghaus broke new ground in his attempts to manipulate the input to the memory system and thus initiated what was to become a trend for later cognitive psychologists: to objectively measure whether a memory was true or false. The relevance of Ebbinghaus's work to autobiographical memory is a highly contentious issue. Some have argued that learning list after list of nonsense syllables has nothing to do with personal memory. Others such as Banaji and

Crowder argued that: "every study conducted on episodic memory since, and including specifically, those of Ebbinghaus, has concerned memory for personally experienced, and therefore autobiographical, information" (1989, p. 1185). At the heart of this debate lies the issue of ecological validity. Can results obtained in a laboratory be extrapolated to real-life situations, or indeed, to the more naturalistic studies of recollective memory? This remains one of the most debated issues in the study of autographical memory today. Although Ebbinghaus succeeded in demonstrating that human memory could be systematically studied, his experiments did not use the kind of material that typically makes up the bulk of what is remembered in everyday life. Despite the controversy surrounding the Ebbinghausian tradition it is clear that his research made an important contribution to the study of human memory. Indeed one could argue that some of his main findings can be usefully applied to the most "unEbbinghausian" of studies. For instance, naturalistic studies of autobiographical memory have found similar results with respect to rates of forgetting and that first and last items have better rates of recall.

**Sigmund Freud**

As a result of their studies Freud and Breuer (1893) maintained that some events from the past are so painful that any recollection of them is unconsciously repressed in order to avoid the suffering or guilt that recalling the event may bring about. For example, one of Freud's patients complained of experiencing debilitating pain in her legs. After many sessions of psychoanalysis it emerged that her pain was located in the same place where her father's legs used to rest on hers when she was caring for him and bandaging his legs. She later went on to reveal that her duties as primary caregiver for her father resulted in her being unable to take up a marriage proposal which she would dearly have liked to accept. Freud suggested the guilt she felt about her resentment towards her father was repressed until it was eventually manifested as pain in her legs.

Freud's work on repression led him to develop the concept of childhood amnesia, a term which refers to the fact people could rarely recall events which occurred in their lives prior to the age of five or six. Freud commented "what I have in mind is the peculiar amnesia which, in the case of most people, though by no means all, hides the earliest

beginnings of their childhood up to their sixth or eighth year" (Freud, 1905). Contemporary cognitive psychologists place the offset of childhood amnesia at a somewhat earlier age: "past the age of ten, or thereabouts, most of us find it impossible to recall anything that happened before the age of four or five" (Morton, 1990, p. 3). Most empirical studies of childhood amnesia suggest that people's earliest recollection does not date back before the age of about three or four (Howe & Courage, 1993; Kihlstrom & Harackiewicz, 1982; Pillemer & White, 1989). Freud's theory of amnesia and repression lie at the heart of the current debate on recovered memories of child sexual abuse, particularly as many of his memory recovery techniques are still used in therapy today. This issue will be addressed further in the introduction. Freud did, however, contribute to the study of autobiographical memory. Of particular importance were his identification of the role that emotion plays and the effects that personal memories have upon a person's subsequent behaviour and personality.

**F. C. Bartlett**

Bartlett (1932) was a great critic of studying memory in the laboratory and, in particular, of Ebbinghaus's work. He argued that the nonsense syllables used as the to-be-remembered material were highly artificial and did not reflect the role memory plays in everyday life. Bartlett carried out a series of studies using stories, pictures and hieroglyphics to investigate the retention of meaningful material. In his most extensive work Bartlett asked subjects to read a Native American folk tale entitled *The War of Ghosts* and then asked them to recount the tale at varying intervals over the following three years. Bartlett's main findings were the progressive shortening of the folk tale coupled with a tendency for the story to become more coherent from the subjects' point of view. Bartlett identified a number of key changes that people made to the story. The main change people made were to omit details that didn't seem to fit into the story line. Another change he identified were rationalizations. People tended to add material that would help them to make sense of the story or change details to make more personal sense. He further found that participants focussed on one part of the story and made it a dominant detail. Participants would also transform details, changing names or the order in which events

occurred to ; participants would often change the names or words in order to give the store more personal meaning. Lastly, Bartlett found that the subjects' attitudes towards the material affected the way in which they later retold the story.

As a result of his findings Bartlett argued that memory was essentially reconstructive and introduced the notion of schemata to explain the distortions participants made to his folk tale. He suggested that the knowledge we have stored in memory is organised in sets of mental packages, or schemata, each of which incorporates all the knowledge, impressions or attitudes of a given type of object or event that we have acquired from past experience. Bartlett found that when people remember stories they typically omit some details and introduce rationalisations, reconstructing the story so as to make more sense in terms of their own personal knowledge and experience. According to Bartlett, the story is assimilated to pre-stored schemata based on previous experience and a new version of the story results from this process of reconstruction.

Some have argued that Bartlett's methodology and theories are too vague to be testable (Cohen, Kiss & LeVoi, 1993; Conway, 1990). Bartlett's work, however, continues to have an important influence on the study of autobiographical memory. Indeed many contemporary psychologists have adopted aspects of his view that autobiographical memory is reconstructive. Further, the modern version of schema theory incorporates many of Bartlett's original ideas, particularly the idea that what is encoded, stored and retrieved from memory is affected by pre-existing schemata which represent previously acquired knowledge (Brewer, 1996).

Whilst researchers focused on the study of human behaviour, interest in autobiographical memory lay dormant in what Cohen (1986) termed "the hundred years of silence". During this time period psychologists' perspectives shifted from behaviorism to an information processing approach and then on to a cognitive approach. Conway has suggested (1990) that the revival of interest in autobiographical memory could be linked to the emphasis which cognitive psychology placed on the representation of knowledge

and to the renewed interest in understanding cognition as it occurs naturally in everyday life rather than in a laboratory.

### A shift in perspective

In the past two decades, renewed interest in the study of autobiographical memory has seen a shift in perspective on the part of cognitive psychologists. Previously, autobiographical memories were seen as metaphorical objects, like books in a library, to be accessed by categorical search. Today, memories are seen as living entities which are affected by prevailing attitudes and motivations at the time of encoding, retrieval and reporting (Ross & McDonald, 1997). This theoretical standpoint regards autobiographical memories as being constructed using components such as narrative, visual and auditory imagery as well as emotion and suggests that memories are not stored as whole items and retrieved as copies of the original experience. Conway (1997) argued that different kinds of traumatic or false memories could be better explained by moving towards a constructivist paradigm of autobiographical memory. Conway stated: "claims that certain types of autobiographical memory, i.e. memories of CSA (child sexual abuse), fall outside of the scope of the constructivist account of AM (autobiographical memory), and therefore should be treated separately are simply wrong" (p. 185). Whether or not one believes that traumatic memories for abuse can be forgotten, the constructivist account of autobiographical memory can certainly help us to understand why some memories, seemingly long forgotten, can subsequently be remembered.

## 1.4 Modern Studies of Autobiographical Memory

### Cue Word Technique

Crovitz and Shiffman (1974) are often credited with the revival of autobiographical memory as a legitimate field of study. They modified Galton's original cue word study by asking subjects to report a *personal* memory to cue words in their study. They found their change in methodology (i.e., prompting a personal memory) elicited more *recollective* memories than the free association technique that Galton used

which tended to elicit rote-learned material (i.e., poetry) or generic memories (Brewer, 1996)

In an attempt to refine the cue word method, Robinson (1976) prompted participants who produced a non-recollective memory to a cue by asking for a specific personal memory. This "Crovitz technique" became a popular method of studying autobiographical memory and has been applied to areas such as: frequency of memories as a function of age distribution (Crovitz & Shiffman, 1974), organisation of autobiographical memories (Conway & Bekerian, 1987) and the retention of autobiographical memories (Rubin, 1982). This shift away from Ebbinghausian methodology resulted in studies higher in ecological validity than the nonsense-syllable learning era and prompted further studies that were more naturalistic in their focus, a few key studies are described below.

**Diary Studies**

As research into autobiographical memory developed, so too did the methodology used to investigate it. Employing the participant-observer methodology, Marigold Linton (1982) and Willem Wagenaar (1986) used themselves as participants whilst William Brewer (1988) used undergraduate students as subjects in three of the most influential longitudinal studies of autobiographical memory. All three of these studies yielded such interesting data that they are frequently cited as the basis for current theoretical debate on studies such as the schematization of repeated events, chronological and categorical retrieval strategies, and low frequency events having higher recall rates.

In the first such diary study in 1982, Linton undertook a systematic six-year study of her own memory. Each day she wrote down descriptions of two or three events that had occurred and rated them on levels such as personal salience and emotionality. Each month she re-read two randomly selected descriptions from the accumulating mass of events. She then attempted to recall what the events were and to estimate the order in which they had occurred. She also attempted to date each event and re-rated them for salience and

emotionality. At the end of her study Linton identified two main kinds of forgetting. One form of memory loss was associated with repetitions of the same event. Over time she found that the uniqueness of repeated events was lost and a schematic, amalgamated, representation of the event remained. Linton also noted a second form of forgetting. Upon reading some of the descriptions she had no recollection of the event ever having happened. Not surprisingly, Linton found that the number of events totally forgotten increased steadily with each year. She found that for recent memories the two types of forgetting happened equally often but for events that had happened more than two years previously total recall failure became more frequent. By the end of the sixth year thirty percent of all the events recorded had been totally forgotten. One interesting aspect to Linton's study was the failure to find any strong relationship between the rated salience of an event at the time of recording and subsequent recall. In interpreting this finding Linton commented that an event's salience is susceptible to change over time. What at first might appear to be an inconsequential moment may subsequently prove to be a pivotal event in one's life and vice versa.

Wagenaar (1986) also used himself as a subject in a six-year diary study of his memory. For over two thousand events he recorded who was involved, where and when the event took place, and what the event entailed. When it came time to test his memory of the events, he presented himself with one cue and tried to recall the information associated with the others. So for instance the "what" cue might have been "had dinner at Jeff and Jane's house", he then tried to recall the "when", "where" and "who" details. His results showed that the percentage of correct answers dropped from seventy per cent to thirty-five per cent over a period of four years. He further found that the most powerful cue was "what" followed by "where" and "who". He found the cue "when" to be almost completely useless, suggesting that memories are categorically rather than temporally stored. These findings have been replicated in a number of studies that have attempted to use different cues to access autobiographical memories (Burt, 1990; Friedman, 1993). What was, however, interesting about Wagenaar's study of cue specificity was that when he used more than one cue at a time, "when" proved to be a particularly effective second cue (Conway, 1990; Wagenaar, 1986). Whilst it is hardly surprising that two cues prompt

better recall than one, the results, showing that temporal information provides the necessary congruent information to increase recall, suggests that temporal information about a memory is indeed encoded as part of the overall memory representation but may be harder to access.

Brewer (1988) used undergraduate students as participants in a longitudinal study of randomly selected events in autobiographical memory. The students carried beepers around with them during the recording stage of the study and Brewer asked them to record where, when and what they were doing whenever they were randomly paged. Testing the participants involved using cues from their own descriptions and asking them to answer a series of questions about their memory of the events. Like Wagenaar, and indeed researchers from the Ebbinghausian tradition, Brewer found that recall was good for events tested immediately but a steady decline in recall was associated with the length of interval between encoding and recall. Brewer also found that temporal cues were ineffective unless they were combined with another cue such as "what" or "who".

**Flashbulb Memories**

Flashbulb memory is a term given to the kind of vivid memories associated with learning about a surprising or traumatic event such as the assassination of President Kennedy. Brown and Kulik (1977) put forth the idea that these were a distinct kind of memory and that a special mechanism existed which caused the scene to be "printed" into memory. Their biological "now print" theory suggested that the scene in which the flashbulb memory was acquired is preserved in memory such as a photograph might be. In their 1977 study they asked forty white and forty black Americans about events such as the assassinations of JFK, Martin Luther King, and Malcolm X. They also asked about non-assassination events such the death of Franco and Ted Kennedy's involvement in a drowning incident. They found that black Americans had a greater number of flashbulb memories for events such as the assassination of Martin Luther King and Malcolm X and suggested that the personal importance and consequentiality of an event was a critical factor in the formation of a flashbulb memory. Brown and Kulik also found that the

ratings of importance were closely related to the length of the memory description that participants gave. The participants' reported rehearsal was similarly related to both the length of description and consequentiality of the event.

There have been many critics of the flashbulb memory phenomenon, most notably Neisser (1982), who argued that these types of memories were vivid due to their frequent rehearsal and high level of emotionality. Neisser also argued that the accuracy of people's flashbulb memories could not usually be ascertained and therefore any claims as to their veracity were unsupported. Using a personal example, Neisser demonstrated that what he had considered to be a vivid and true personal memory was in fact false. He recalled learning about the bombing of Pearl Harbour and said that he learned about the attack while he was listening to a baseball game on the radio. He realized, years later, that this would have been impossible as baseball is not played in December, the time the attack took place. Thompson and Cowan, however, later suggested that Neisser's memory of the bombing of Pearl Harbour may have been more accurate than it may first have appeared (Thompson & Cowan, 1986, p. 199). Neisser has since conceded that he was in fact listening to a football game and suggested that he confused football with baseball due to the similarity between the names of the teams.

In a further attempt to establish the nature of flashbulb memories, Neisser and Harsch (1992) obtained data on the Challenger disaster. They collected data within a day of the space shuttle's explosion and carried out recall tests two and three years later. They found that at least a quarter of the participants' recalls were completely in error and only a small percentage of participants provided the very same description as they had originally. Furthermore, Neisser and Harsch found that confidence ratings participants assigned to their memories were not related to their accuracy. Indeed participants who were inaccurate were just as likely to be confident in their memories as those whose memories were accurate. Neisser and Harsch used this data to argue that flashbulb memories are recalled in the same way as other kinds of vivid memories and suggested that they do not hold any special status within the autobiographical memory system.

It would appear that the main problem associated with studying flashbulb memories is that it is almost impossible to constitute what a flashbulb *event* actually is. For example, when Brown and Kulik originally proposed their theory they maintained two factors were necessary for the formation of a flashbulb memory. Firstly the event had to be surprising and secondly it had to be *personally* consequential. Specifically they asked participants to indicate how their lives might have been different had the flashbulb event not occurred. They further emphasised to participants that consequentiality should be based on the personal importance of the event and not be assessed based on national or international importance. Brown and Kulik focussed their studies on many events surrounding the civil rights movement, an era that is arguably of great importance to both American history and American citizens. It could be argued that since Brown and Kulik's initial study few, if indeed any, studies have actually researched flashbulb events per se, that is if one were applying their criteria of surprise and consequentiality. For example, Conway, Anderson, Larsen, Donnelly, McDanial, McClelland, Rawles and Logie, (1994) conducted what they termed a flashbulb memory study on the resignation of Margaret Thatcher. It could be argued, however, that to those who kept themselves abreast of the news on a regular basis there was little surprise surrounding her resignation. Furthermore her successor maintained her policies to the extent that Thatcher's resignation could not have had any direct consequences on the average person's life. If one accepts either of these two arguments then Conway et al. (1994) might not have been studying flashbulb memories, at least as defined by Brown and Kulik, at all. One could also apply these arguments to the studies on the Challenger disaster (McCloskey, Wible & Cohen, 1988; Neisser & Harsch, 1992). Whilst there is no argument that the accident was tragic and sudden, space travel was at no means without risk and the surprise factor, therefore, could hardly be compared to the surprise that might be associated with hearing of an event such as the assassination of JFK. Furthermore, how *personally* consequential to the general public was the Challenger Disaster? Certainly it would have been rather shocking to watch television footage of the explosion over and over again, but would the average person's life be any different had this event not occurred?

Overall there is little agreement about the nature of flashbulb memories. Whether they belong to a special class of memories depends on which side of the fence one sits on. A number of researchers immediately began flashbulb memory studies in the wake of the September 2001 terrorist attacks in the United States. Their results, given the global nature of those events, will likely provide the most interesting data on flashbulb memories to date and will add to the debate in the years to come.

**Memory for scenes and events**

Research on memory for scenes and events involves asking how well people remember events experienced in everyday life. Brewer and Treyens (1981), for example, showed participants photographs of a graduate student's office and then asked them about items that had not actually been present in the office, for instance books, thus implying their presence. In response to this participants often reported that the critical item had been present when it had not been. Brewer and Treyens suggested that because people have a schema-based belief about what items are typically present in a graduate student's office, they incorporate that belief into the memory record, and report the presence of books in the office. In a later study, Brewer and Pani (1983) developed the methodology by questioning participants about the presence of visual imagery during recall trials. They found participants reported the same number of visual images for items that they had actually seen as items they imagined having seen, suggesting that schema-based information is incorporated into participants' memories. Contrary to this finding, however, other studies such as those carried out by Schooler, Gerhard and Loftus, 1986, have shown that inferred items have not evoked as much sensory information as actually-presented items (Brewer, 1996). These findings will be discussed later in this introduction with regard to people's use of imagery as an indicator of memory accuracy.

Research on eyewitness testimony comprises much of the research carried out on memory for scenes and events. Using experiments that attempt to mimic real-world situations this line of research is concerned with questions about how accurately people can describe an event they witnessed some time previously and what factors are

responsible for making their reports more or less accurate. Elizabeth Loftus, and her colleagues, have conducted much of the research on eyewitness testimony. Briefly, her work on memory distortion goes back to the early 1970s, when she began studies on the "misinformation effect". These studies show that when people who witness an event are later exposed to new and misleading information about it, their recollections often become distorted. For instance, in one study participants viewed a simulated automobile accident at an intersection with a stop sign. After the viewing the scene, half the participants received a suggestion that the traffic sign was in fact a yield sign. When later asked what traffic sign they recalled seeing, those who had been given the misleading suggestion tended to claim that they had seen a yield sign. Those who had not received the misinformation were more likely to accurately report having seen a stop sign. Several conditions can affect the extent of the misinformation effect on memory. The effect can be stronger when the post event misinformation relates to peripheral rather than central details (Cassel & Bjorklund, 1995; Cohen, Kiss & LeVoi, 1993). The effect can also be stronger when the retention interval is longer (Belli, Windschitl, McCarthy & Winfrey, 1992). Further, when participants are unaware that they are being deceived they are more likely to accept the misinformation (Cohen, Kiss & LeVoi, 1993).

**Source Monitoring**

Source monitoring is a framework developed by Johnson and her associates (Johnson, Foley, Suengas & Raye, 1998; Johnson, Hashtroudi & Lindsay, 1993). Source monitoring concerns the processes involved in determining the source of a memory, for example how, where, and when a particular recollection was acquired. According to Johnson and her colleagues source monitoring refers to "a variety of characteristics that determine the conditions under which a memory is acquired" (Johnson et al., 1993, p. 3). The source monitoring framework grew from work on reality monitoring first carried out by Johnson and Raye (1981) which concerned the processes people use in deciding whether information initially had an internal or external source. Experiments of this genre typically ask participants to discriminate between externally and internally generated information such as something you saw and something that you imagined or thought

about. Source monitoring decisions are often made quickly and unconsciously and are based on the phenomenal characteristics of the memory, such as instances of visual or auditory imagery. This would seem logical as our memory system would be very slow indeed if we searched for the source of every memory we accessed on a day-to-day basis. Other more strategic source monitoring processes are rather slower and involve a more deliberate retrieval that often demands supporting memories and congruence with self-knowledge (e.g.; I have never been to that area of New York).

Studies carried out by Johnson et al. (1988) found qualitative differences in the way participants rated real and imagined events. They also found differences in the way that participants rated real and imagined events. Memories for real events contained more details, such as visual and auditory imagery, than imagined events and were also rated as feeling more realistic to the participants. Further, actual events cued more supporting memories than imagined events did. Imagined events, on the other hand, were rated as being higher in cognitive complexity probably due to the fact that the creation of imagined events by participants was deliberate and relied on more than their simply recalling an actual event.

The results from this line of study have direct implications for the research presented in this thesis. For instance, Johnson et al. (1988) found that when they increased the similarity of information from different sources, real and imagined events, participants were more likely to confuse the source of the memory. Other studies have also found that when two sources of a memory are similar, source monitoring suffers and failures in accurate recollection are more likely to occur (Gruppuso, Lindsay, & Kelly, 1997). In the case of twins disputing memories one could argue that there is a semantic element to their shared lives. For instance, if an event is plausible for one twin it is likely to be plausible for the other (unless the event was idiosyncratic). In this case the source is their shared experiences which, as the research described below will demonstrate, can easily be confused and misattributed not only between themselves but also by other individuals. Further, Gruppusso et al. (1997) found that source monitoring failures were reduced when the sources of the information were dissimilar. The results from this study

could help to interpret why the incidence of disputed memories occurs less frequently in non-twins than twins. Source monitoring failures lie at the heart of many kinds of error in memory and there has been a growing appreciation for the role that source monitoring plays in both cognition (Johnson et al., 1998), and memory distortions (Hyman 1999).

## 1.5 Phenomenal characteristics of autobiographical memories

There is much debate as to whether phenomenal reports should be classified as data in the same way as data derived from behaviour such as reaction times or number of correct responses. Using an analogy from the physical sciences Brewer (1996) points out that a chemist would not ignore the difference in colour of two similar substances. He or she would instead try to encapsulate that difference in the form of a theory. Psychologists, Brewer argues, should also try to capture differences in phenomenological reports, combining them with behavioral data in an attempt to develop theories that reflect the richness of the data available to them. For example a researcher studying memory for word lists or songs may collect behavioral data, such as reaction times and number of correct responses, as well as phenomenological reports of recalling the material such as auditory imagery. This combination of data would provide more insight than one data set might by itself.

### Visual Imagery

Visual imagery is one of the most commonly reported phenomenal characteristic of autobiographical memory. It has been noted (Brewer, 1986; Brewer, 1996; Rubin, 1998) that people frequently use reports of visual imagery to support the authenticity of their recollections. People often argue that, because they can "see it as plain as day" or "as if it were happening right now", they must be correctly remembering a past event. It is interesting then that researchers have shown that reports of imagery, which do not accurately reflect the to-be-remembered material, relatively easy to induce in laboratory settings (Brewer & Pani, 1983; Roediger, McDermott & Goff, 1997). Research has also shown that subjects often give reports of visual imagery when the image is either only

suggested (Loftus & Hoffman, 1989) or schema-based as in the Brewer and Pani (1983) study of a graduate's office previously discussed.

**Point of View**

An interesting aspect of an image is whether it is recalled from the individual's own field of view or from the standpoint of an observer. Nigro and Neisser (1983) demonstrated that the point of view taken during recollection was related to the purpose of recall, the original experience, and the time elapsed between event and recall. Nigro and Neisser pointed out that memories recalled from the observer perspective must, by their very nature, be reconstructed as the original event must have been experienced from the field perspective. In a series of four studies, they showed not only that the distinction between the observer and field perspective is a meaningful one but also that older or less emotional memories tend to be recalled from the observer perspective and recent or highly emotional memories from the field perspective. The twins who took part in this research were asked to report on the point of view of their disputed memories and the results indicate that a dispute over a memory can affect the point of view from which it is subsequently recalled.

**Confidence and accuracy**

In his 1988 study of undergraduates who recorded events when they were beeped, Brewer found a significant relationship between his participants' reports of visual imagery and the accuracy of their memories. This study also provided direct data showing that subjects' confidence judgments were reliable indicators of memory accuracy for events from their lives. Brewer found that when participants were asked, at recall, how confident they were in their responses, correct responses were given high mean confidence rating and incorrect responses were given very low mean confidence rating. Brewer argued that the participants were able to access metamemory processes that allowed them to classify correct and incorrect responses. There is also evidence that participants can be quite accurate in predicting their future memory performance at input. For example, in Wagenaar's study of events from his own life, he predicted his ability to recall an event at

the time he recorded it. The events he assigned the lowest predicted ability to recall in the future were indeed recalled correctly less than 5% of the time. Conversely, events he predicted that he would later remember showed recall rates of more than 85% (Wagenaar, 1986).

The relationship between confidence and accuracy is a key issue in eyewitness research but the findings have varied on how strong that relationship is. Some researchers have found that the most important criteria jurors use to assess the credibility of witnesses is the confidence they express in their memories (Brewer, 1996; Lindsay, 1994; Penrod & Cutler, 1996). Other studies have indicated that the relationship between confidence and accuracy for eyewitness identifications is quite weak (Wells 1993). Further evidence of a tenuous link between confidence and accuracy is derived from Neisser and Harsch's 1992 study. As mentioned above, their participants reported high confidence levels for their recall of the details surrounding hearing the news of the Challenger disaster yet they were often incorrect in their recall. Clearly there remains debate about the relationship between confidence and accuracy and more data are needed before any firm conclusions can be drawn.

**Irrelevant Detail**

Just as the presence of visual imagery is often taken as evidence by those experiencing it of a memory's authenticity, the presence of irrelevant detail is often cited by lay people as *proof* that a memory is accurate. As discussed by Brewer (1996) researchers have stressed the importance that irrelevant details have on judging memory reports. Brown and Kulik (1977), for instance, used the presence of irrelevant detail in participants' reports as support for the copy component of their flashbulb memory theory. Bell and Loftus (1989) similarly found that mock-jurors often judge memory accuracy based on the inclusion of irrelevant detail cited by eyewitnesses. Brewer's 1988 study of random events in the lives of undergraduates indicated that the presence of irrelevant detail was reliably related to both the strength and accuracy of the memory.

As previously noted, Brown and Kulik used the presence of irrelevant details as support for their theory that suggests a flashbulb memory is a copy of the original experience, much like a photograph would be. Brewer (1996) argued that autobiographical memory was only partly reconstructive and agreed with Brown and Kulik that, because recollections often contain irrelevant detail, there was likely to be a copy component involved in the encoding of flashbulb memories. It could however be argued that the presence of irrelevant details in non-flashbulb memories weakens Brown and Kulik's argument for flashbulb memories being a distinct kind of autobiographical memory. Indeed it is possible, as has been argued by Neisser and Harsch (1992), that flashbulb memories are simply recalled better because they involve emotionally charged events and are frequently repeated and thus rehearsed. In their laboratory study of words relating to emotion Rubin and Friendly, (1986), found that highly emotive words were recalled more often than non-emotive words. Wagenaar (1986) also found that emotion was reliably related to strength of recall. In the six-year study of his own autobiographical memory Wagenaar found that events he originally rated as important or emotional had higher rates of recall than neutral or negative events. Other research has also shown that positive emotional events are recalled better than negative emotional events (Brewin, Andrews & Gotlib, 1993).

**Affect**

One component of autobiographical memory that has received considerable attention in the past decade is affect. The results from studies carried out by Forgas, Bower and Krantz (1984) suggest that participants' description of their current mood had an effect on how they perceived events from their past. They asked participants to describe their current emotional state and then asked them to view a video clip of themselves recorded some time previously. They found that when participants' current mood was negative they were more likely to describe events in the video in a pejorative manner. Conversely, when their current emotional state was positive. Forgas et al. (1994) suggest that this is due to the fact that the memory is reconstructed using one's current goals, attitudes and emotions. In reviewing the literature Robinson (1996) suggested that

participants' prevailing mood can make it difficult to accurately describe past events or emotions. This kind of retrospective bias has also been shown to exist in the recollection of previous attitudes (Dawes, 1998; Robinson, 1996; Schacter, 1995). In an interesting longitudinal study by Markus and Nurius (1986), people were asked, in 1973, to rate their attitudes towards salient social issues. Thirteen years later they were asked to rate their current attitudes, and were also asked to report what their attitudes in 1973 had been. Markus et al.'s main finding was that participants' *memories* for their 1973 attitudes were more closely aligned with their current attitudes than to what their attitudes had actually been. This suggests that current attitudes can distort recollections of what was once believed even when a significant shift in attitude is involved.

### 1.6 The Veridicality of Autobiographical Memory

Although autobiographical memories are often veridical, for example I know I went to the supermarket yesterday and bought bananas, a number of conditions exist in which memories held with a great deal of confidence are in actual fact incorrect. As Neisser and Harsch found in their 1992 study of the Challenger disaster, people often believe their memories represent a true account of the past even when they are presented with evidence that they are incorrect. In his research on confabulation in clinical patients, Moscovitch (1995) found that people believed their memories to be accurate even when they knew their memories were unlikely to have occurred. Research on reality monitoring may offer some insight into why people are resistant to suggestions that their memories are false. For example, if someone generates a visual image of an imagined event they are more likely to believe that the event actually occurred and thus lead to a breakdown between belief and accuracy (Johnson & Raye, 1981).

Some researchers have concluded that memory distortions occur to enhance past performance. Bahrick (1979) has suggested that memory shifts in a self-aggrandising direction to allow for a more comfortable recollection of the past. One suggestion put forward by Bahrick was that positive memories are rehearsed more often than negative memories thus prolonging the retention level of the memory. Rehearsal, however, has

been associated with systematic distortions to a memory that can occur through repeated reconstruction, similar to distortions participants made to Bartlett's folk tale in 1932. An excellent example of the prestige-enhancing nature of autobiographical memory comes from an ingenious study conducted by Ulric Neisser in 1981. Neisser examined John Dean's testimony during the Watergate trial which ultimately resulted in Richard Nixon's resignation. When Dean originally made his 245 page statement to investigators, detailing all of the events which led up to the scandal, he was heralded as having such an incredible memory that he was dubbed the "human tape recorder" (Neisser, 1982, p. 140). Dean, however, was unaware that complete tape recordings of his conversations with Nixon existed. Upon examination of these tape recordings Neisser found that much of Dean's testimony was unsupported. Although Dean often correctly reported the gist of conversations his memory for details and dates was incorrect and often inflated the role he played. The study led Neisser to suggest that autobiographical memories are *repisodic*. By this he meant that many of Dean's single recollections were in actual fact representations of repeated actions that had in fact occurred. Neisser suggested that distinguishing details were lost and a schema-like representation took their place. For example, during the trial Dean testified that Nixon was willing to pay blackmail money and attributed that conversation to one particular meeting (which he actually attributed to the wrong day). It became clear from the transcripts that Nixon referred to blackmail as a way of preventing the scandal from becoming public on a number of occasions at different meetings. Neisser commented "what seems to be specific in his memory actually depends on repeated episodes, rehearsed presentations, or overall impressions. He believes that he is recalling one conversation at a time but he is mistaken" (Neisser, 1982, p. 158).

### 1.7 False Memories

During the past decade, there has been an enormous upsurge in the number of adults who have reportedly recovered memories of past child sexual abuse whilst undergoing psychotherapy. The resulting accusations are often denied and cause untold damage to family relationships and trauma for everyone involved. Whilst there is no question that child sexual abuse is a serious problem, what is of greater interest to

cognitive psychologists are the cases where abuse memories are recovered during the course of psychotherapy. This issue has been the focus of intense and controversial debate between memory theorists and therapists, particularly with regard to the true source of these recovered memories. Ethical considerations obviously preclude direct experimentation and so theorists have been forced to rely on naturalistic experiments in an attempt to delineate the factors involved in the "creation" of such memories.

In a preliminary attempt to assess whether wholly *false* childhood memories could be implanted in adults, Loftus and Pickrell (1995) asked subjects about three true events from their past and one false event. The false event was the same for each subject: that at the age of five they got lost in a shopping mall and became very upset. Over the course of a few weeks, participants were asked to write down what they remembered about each event. At the end of the experiment, Loftus et al. found that 25% of the participants had created a false memory of being lost in a shopping mall.

In a similar study Hyman, Husband and Billings (1995) found that several factors contributed to the creation of false childhood memories. Briefly, their research involved asking college participants about three real incidents from their past (provided by their parents) and one foil incident, which again was the same for everyone: That when they were younger they attended a wedding reception and knocked over a punch bowl. All the foil incidents were presented as if the information had been supplied specifically for them by their parents. In the first interview very few students claimed to recall the foil event. In subsequent interviews, however, 15-25% of the students not only claimed the event actually occurred but also provided supplementary information about the experience. These memories included sensory details, such as the reaction of their parents or the location of the wedding, details that had not been provided by the experimenter. Hyman et al. found that the way in which the participants responded to the foil event during the first interview had a direct effect on whether a false memory was subsequently created. For example, participants who linked the event with their past and talked about whose wedding it was likely to have been or where the event was likely to have occurred, were those who were more likely to eventually create a false memory. Hyman et al. also found

that asking participants to form a visual image of the event, and to describe and elaborate on the event as best they could, increased the likelihood of participants creating a false memory.

Recent research on the role imagination plays in memory suggests that it also has implications for some of the ways we misremember our past. In reviewing the literature, Garry and Polaschek (2000) suggested that imagining contrary-to-truth experiences can actually change a person's memory. They proposed that imagination plays a role in the participants' acceptance of the shopping mall (Loftus, 1993; Loftus & Pickrell, 1995) and punchbowl memories (Hyman & Billings, 1998) by providing a strategy for remembering an event that they did not experience.

To explore the effect of imagination on memory, Garry, Manning, Loftus and Sherman (1996) devised a three stage experiment which tested participants' confidence in their memory for past childhood experiences. They began by asking participants about a list of plausible childhood events, for instance breaking a window, and then asked them to indicate whether they had ever personally experienced the event. After a delay of two weeks, the same participants were asked to imagine some of these events having happened to them. In the third step the list of plausible childhood events was again presented and participants were asked to indicate whether each event had ever happened to them. Their results showed that imagining an event, contrary to truth, increased participants' confidence ratings that the event actually occurred. Other studies in false memories have found similar results. Pezdek, Finger and Hodge (1997) implanted a false memory in approximately 20% of high-school aged subjects that they studied. Roediger and McDermott (199) showed people create false memories in simple recall tests of word lists. There is thus an abundance of evidence that people can indeed be induced to claim ownership of memories they did not actually experience themselves.

People misremember their own events but do they ever claim the memories of others as their own? Barclay and Wellman's (1986) study of university students offers direct evidence that people do sometimes claim ownership of other people's memories.

They asked college students to record information about three autobiographical events every day during a four-month period. Then, following different time intervals ranging from one month to a year, they gave participants a recognition test in which they were presented with actual events and foil events. They found that although the participants correctly identified their own memories with more than 90% accuracy, they were less successful in rejecting the foil events (which were actual events that were experienced by students at the same university but not by the participants in this study). Participants' rates of falsely accepting the foil events as their own memories increased from sixteen percent after three months to an astonishing forty-one per cent after ten months. Other research conducted by Burt, Mitchell, Raggat, Jones and Cowan (1995) also found that people sometimes adopt others' memories. In their study participants were asked to identify photographs of both their own personal experiences as well as photographs of other participants' experiences. Although participants made few confusions some did mistakenly claim other people's photographs as their own. Indeed in some cases participants went so far as to describe the circumstances under which the photographs had been taken.

### 1.8 A cognitive explanation

In surveying the literature Hyman (1999) argued that because there are many different kinds of memory error a global theory of memory is not feasible. Stating the need for a classification system, Hyman suggested that for progress in research to be made memory errors could not be referred to as either false memories or instances of gist. His classification system broke down memory errors into two broad categories: schema-based reconstructions and source monitoring failures. Under the broad heading of schema-based reconstructions Hyman identified three types of memory error: gist, intrusion and inference errors.

First identified by Bartlett in 1932, gist errors occur when people lose specifics of an event but preserve a general understanding of what took place. Other forms of gist errors include conjunction errors in which people combine images of two faces into one

(Hyman, 1999) and memory for scripts (Schank & Abelson, 1977). Dean's repisodic memory (Neisser, 1982) could also be considered to be a form of gist memory; where information from several instances was blended into one, more general, representation that is ultimately recalled. Another type of schema-based memory error in Hyman's classification system is intrusions. These errors occur when information is added to the memory that was not originally present, the added information not always being consistent with the original material. Past research has shown that intrusion errors occur for stories (Bartlett, 1932), word lists (Roediger & McDermott, 1995), rooms (Brewer & Treyens, 1981) and songs (Rubin, 1995). Similar to gist errors, intrusions occur when there is a general understanding of the material but they more detailed than gist errors. Hyman suggested a further type of schema-based errors was inference errors. First described by Ross in 1989, inference errors occur when a person tries to recall a previous mental state or attitude. For instance, individuals may not now approve of the death penalty and assume that they never have. Inferences generally work (Hyman, 1999) but may lead to error on occasion. Hyman's second category of memory errors is source monitoring failures. A type of memory error belonging to this category is misinformation. Despite there being different theories over its origins (Loftus, Miller & Burns, 1978, McCloskey & Zaragoza, 1985) misinformation can broadly be described as instances where two sources of information become blurred into one more general understanding of the event. Another memory error in this category is source monitoring errors. This type of memory occurs when the source of the memory is either misattributed or completely forgotten. For instance, participants in a study of names were given lists of famous and non-famous names. When participants were subsequently asked to indicate whether names belonged to famous or non-famous people they often identified non-famous names as famous names because they had heard of the name before but could not discern the source of the information (Jacoby, Kelley, Brown & Jasechko, 1989). A further kind of source monitoring error Hyman identified is time-slice errors, where a correct event is selected but attributed to the wrong time or date. Brewer found this to be a common type of error in his 1988 study of events from the lives of undergraduate students where participants retrieved the wrong event to a cue. Hyman concedes that there is an "other" category which includes complex autobiographical memory errors. Examples of this would be

Brown and Kulik's flashbulb memories and most of the false childhood memories (Hyman, Husband & Billings 1995; Hyman & Pentland, 1996) which cannot simply be labeled as schema-based errors or source monitoring failures.

Having established a classification system, Hyman offered a cognitive explanation as to why people make memory errors. He proposed three elements to be necessary in the creation of a false memory: 1, Event acceptance, 2, Imagery, and/or narrative creation, 3, Source monitoring error/failure. In the first instance, event acceptance, an individual has to believe that the false memory *could* have happened for it to be accepted as a personal memory. Two main factors influence whether an event is accepted. The first is the source of the memory. Participants are unlikely to believe a stranger suggesting something happened but if the information is presented as having been supplied by the participants' parents, the event is more likely to be believed. The second factor Hyman suggests necessary for event acceptance to take place is the event itself. For instance someone is less likely to believe that they were abducted by aliens when they were five than that they knocked over a punch bowl at the same age. In the case of the punchbowl incident, if participants claimed that they could not remember the incident, the experimenter suggested that they had repressed the memory due to its embarrassing nature. Here the source of the memory is someone in an assumed position of authority and the participant is more likely to believe him or her and accept the memory as true.

The second element Hyman suggested necessary in false memory creation is the construction of a narrative or image. A person may believe an event is plausible but to truly believe it they must construct an image or narrative which is achieved by combining schematic knowledge with personal knowledge. A person may look back and remember attending family functions and consider where the punch bowl incident could plausibly have occurred. They would then go on and construct an image or narrative based on a combination of those elements. Hyman suggested that encouraging participants to imagine the event often led them to construct an image or narrative. For example, some participants would describe whose wedding it was and what the parents of the bride

looked like. Indeed some went as far as describing their parents' reaction to their misbehaviour!

Finally Hyman contended that the creation of a false memory requires a source monitoring error to be made. A person may think an event is plausible and may even create an image of it in his or her mind but, for the event to become an actual memory, its source must be identified. Many of the participants in Hyman's study claimed to have a visual image of the punch bowl incident but did not claim that image as a personal memory. Instead they noted that this was just an image that they created indicating that they had correctly monitored the source of the image. Hyman (1999) points out that memory for the source of information can fade more quickly than memory for the actual content. This could lead someone to remember the false suggestion, forget the source of misinformation, and incorrectly attribute the source to their own memory. Rehearsal also affects the chance that a source monitoring error will be made by making the event seem more familiar. Lastly, differences between individuals affect the tendency to make a source monitoring error. Phenomenal characteristics of the constructed memory such as clear visual images or higher levels of self-involvement may also increase the likelihood that participants believe the narrative is actually a personal memory (Hyman, Gilstrap, Decker, & Wilkinson, 1998). It is of note that the order of event acceptance, image construction and source-monitoring failures in the creation of false memories is not necessarily linear. Indeed Hyman suggested the process was more likely to be interactive, with the construction of an image or narrative, affecting one's assessment of the plausibility of the event and vice versa.

### 1.9 Autobiographical memories of childhood events

It is not clear whether Hyman's classification of memory errors and his cognitive explanation for the creation of false memories also applies to memory for childhood events. Given the rise in reported cases of past child sexual abuse much attention has been focused on the veracity of children's memories (Schacter, 1995). Results from studies on source monitoring in children suggest that children sometimes have difficulty separating

reality from fantasy. In one study, for example, Ceci, Loftus, Leichtman and Bruck (1994), presented children with a list of events, some of which they had experienced, and some of which they had not. In the following week after presentation the children studied events on the list and for each event they were instructed to think "real hard if it happened". Approximately one third of the children developed a false memory of the event. Other researchers, on the other hand, have provided evidence that children's memories are generally reliable and resistant to suggestibility (Goodman, Rudy, Bottoms & Aman, 1990). There is general agreement that people have no memories from before their first birthday, very little from before their second birthday and poor memory from before their fourth birthday (British Psychological Society, Working Party Report, 1996). Further, young children do not have the necessary cognitive resources for processing and retrieving complex information.

At the heart of the repressed memory debate lies the question of whether adults can forget incidents of trauma from their childhood. Studies on infantile amnesia suggest that traumatic events can be forgotten or lost if they occur before the autobiographical memory system is fully developed (Pillemer & White, 1989; Terr, 1988). Chrstianson has similarly found evidence to suggest that details of traumatic events can be misremembered if they occur at a young age (Christianson, 1992, p. 207). The ability to recall traumatic events increases with age and also depends on whether the event was repeated. In an attempt to examine memory of traumatic childhood events, Linda Williams interviewed women who, seventeen years earlier, had visited a hospital casualty ward and were evaluated as having been sexually assaulted. She found that thirty-eight per cent of the women did not report the abuse that had been documented upon their admission to the emergency ward (Williams, 1994, p. 1167) despite mentioning other incidents of abuse. Twelve per cent of the sample reported no past experience of abuse at all. She further found that the women who were younger at the time the documented abuse took place, and those whose abusers were known personally, were less likely to report the abuse. It is not clear why 50% of the sample failed to report the index abuse. Williams, however, suggested that these data support the theory of dissociation and that coping mechanisms may have caused some of the experiences to recede over time. In a comment on this

research, Loftus, Garry and Feldman (1994) maintain that this rate of forgetting is not as dramatic as it may seem and compared it to findings that 20% of a sample failed to remember the death of a family member when they were four years old (p. 1178). It could be argued, however, that this comparison ignores qualitative differences between these two types of experiences. For example, Freyd (1996) has suggested that two emotions are related to traumatic memories: terror and betrayal. She argued that terror, an emotion that may be associated to experiencing the death of a family member, enhances memory performance. Betrayal on the other hand, an emotion often associated with sexual abuse, leads the memory to become less accessible and more difficult to remember through processes such as dissociation. There is much debate as to whether traumatic memories have special properties setting them apart from other types of memory (Christianson, 1992; Kihlstrom, 1996; Terr, 1996). Some have put forward a biological explanation to account for differences in encoding. Nader, Schafe and LeDoux (2000) suggested that that the storage and retrieval of long-term memories of fearful experiences are surprisingly unstable and easily altered due to chemical processes in the brain. Given the fact that the debate on this issue is far from being resolved it difficult to draw any conclusions from Loftus et al.'s comments. One thing that can be taken from their critique of Williams' work, however, is to err on the side of caution when interpreting her results.

Clinicians have also attempted to corroborate reports of child sexual abuse. Herman and Schatzow (1987) worked with fifty-three women who claimed to have recovered memories of child sexual abuse through the course of therapy and asked them to provide evidence that the abuse had indeed taken place. Of the women who actually attempted to find corroborating evidence, seventy-four percent of them returned with confirmation the occurred. However it is not clear from the literature what that corroborating evidence was other than "somebody perceiving their earlier ordeals" (Terr, 1996), nor is it clear how many of the fifty-three women attempted to find corroborative reports. Consequently, it is not possible to accept the conclusion that their patients' recovered memories were indeed memories for experienced events from their childhoods.

Recently there has been growing concern with regard to some forms of memory recovery techniques used in counseling and psychotherapy. Critics have charged that some of these techniques can lead non-abused clients to develop non-veridical memories of child sexual abuse (Lindsay & Read, 1994). Practitioners, on the other hand, have claimed that this is just a further denial of victims' rights and society trying to ignore a serious social problem. To understand the issues involved in this debate one first needs to look at what forms of memory work are being criticized and why. While it is likely that some forms of therapy can help people to recover remote, but accurate memories, some of these same practices may enable non-abused clients to acquire erroneous but firmly believed memories of abuse. The greatest concern that memory theorists have is on the combination of techniques commonly used in psychotherapy. These include informing clients that their symptoms are symptomatic of repressed memories of past sexual abuse; using memory recovery processes such as visualization or hypnosis to invoke memories of child sexual abuse; asking patients to imagine the abuse, dream interpretation and recommending popular books. Coupled with these techniques is the endorsement of the memories by the therapist which, it is clear from the social and cognitive psychology literature, could lead a patient to feel more confident in their memories of the abuse (Schacter, 1995). Specifically, the research on false memories outlined above shows that people may be confident of "memories" that are products of suggestion and, more importantly, people are often not able to discriminate the source of the false memory. One reason for this occurrence is that many of the techniques used by therapists encourage clients to visualize incidents of abuse. As noted by Belli and Loftus visualization appears to be an important element which leads people to remember imagined or suggested events as having occurred. For example, when participants created an image of the postevent misinformation they were much more likely to recall the suggested event as an actual event they experienced (Belli & Loftus, 1996, p. 174). Indeed it could be argued that many of the conditions under which clients undergo therapy mirror the ideal laboratory conditions in which participants are likely to create a false memory during an experiment! For example, the perceived authority of the source of suggestion (therapist), rehearsal (weekly visits), the delay between the to-be-remembered event and time of retrieval (past childhood), plausibility of the event (event acceptance) and the use of imagery.

Despite there being an abundance of evidence that false memories can be created (Hyman, Husband & Billings, 1995; Loftus & Pickrell, 1995; Roediger, McDermott & Goff, 1997) many critics contend that these results bear little relationship to real life. Some have asserted that whilst it may be easy to manipulate trivial changes to autobiographical memory in the laboratory there is no evidence that traumatic memories can be either implanted or manipulated. Herman and Harvey (1993) argued that experimental results cannot be extrapolated to real life and are thus irrelevant to the debate on child sexual abuse. There are indeed limits to the degree to which experimental findings generalize real life circumstances as certain relationships may apply under certain conditions and not under others.

A good example of the applicability of laboratory experiments to real-life situations is a study carried out by Morris, Gruneberg, Sykes and Merrick (1981). They tested men's retention of soccer scores from a league. They began by first establishing a knowledge (if not passion) for soccer and found a correlation of .81 between knowledge of soccer and correct recall of match results. In a later study, Morris, Tweedy and Grueneberg (1985) tested retention using two different conditions, actual results and fictional (but plausible) results which participants knew were experimenter-generated. They found a significant difference between recall of the true and false results. Morris et al. suggested that the differences in recall between the results were due to motivation to remember. The participants knew the results were fictional, and thus did not affect the outcome of the teams' overall placement in the league, and were not motivated to remember the score. This is simply one example of how laboratory materials can be used to replicate real-life though the attempt does not always prove to be fruitful, particularly when participants are aware that the material is being manipulated by the experimenter.

### 1.10 The Present Studies

The present research can be seen as an example of the increasing interest that researchers have shown in the last fifteen years in the fallible nature of autobiographical memory. The studies carried out for this dissertation all focus on memories whose

ownership is in dispute between two people (in these studies, mostly twins). Disputed memories differ from memory errors studied by other researchers in that the major detail that is in dispute is who the protagonist in the event is, a detail that is at the heart of the definition and use of self in autobiographical memory (Rubin, 1998). From the existing literature on autobiographical memory, several factors emerge as being of possible importance for this phenomenon. For example, people frequently cite reports of visual imagery to support the authenticity of their autobiographical memories. They argue that because they can "see it as plain as day" or "as if it were happening right now", they must be correctly remembering a past event (Rubin, 1998). Hence, in the first study attention was paid to the imagery that was reported as present in the disputed memories and compared to imagery reported as present in the non-disputed memories. Attention was also paid to the confidence participants had in their disputed memories as well as other phenomenal characteristics of their memories.

The aim of this research was not to ascertain the accuracy of the memories, nor to resolve questions of who the rightful owner was. Instead the focus was on such questions as: do twins have experience memories? How often? Are monozygotic twins more likely to report disputed memories than dizygotic twins? What kinds of memories are disputed? Are these disputed memories similar between twins? Do they differ from ordinary, non-disputed memories? Is the possession of disputed memories limited to twins? Are disputed memories simply an indication that the same event can be experienced in qualitatively different ways by two different people?

An important methodological issue concerned how disputed memories should be elicited. One way was simply to ask people whether they have experienced disputed memories with others and then to collect data on those memories. This method acts as a good catchall for collecting data on disputed memories but there is, of course, the risk that demand characteristics might encourage participants to report a higher number of disputed memories than they have in fact actually experienced. Clearly, there would be much less risk of demand characteristics influencing the results if twins produced memories in response to Galton's method of semantic cuing (Crovitz & Shiffman, 1974; Galton, 1880;

Rubin, 1982) without mention of disputed memories. This method, however, also has its disadvantages. It is not possible for the cue-words to cover every situation which might give rise to a disputed memory. The cue-word method does, however, allow for a base-line measure of the frequency and types of memories that are disputed. There is also an added advantage in applying a traditional autobiographical memory research tool to a new area of research. Another issue of concern was whether the occurrence of disputed memories was exclusive to twins? Do other sets of the population, for example siblings or friends, also experience this kind of memory error?

In view of these methodological concerns five studies were conducted for this dissertation on disputed memories. The first study reported here involved asking twins directly whether they had experienced disputed memories with their co-twin, and these memories were compared with their shared non-disputed memories (i.e., shared autobiographical memories on whose ownership both agreed) using a questionnaire devised by Rubin, Schrauf and Greenberg (2001). The questionnaire focuses on different properties and component processes of mental experience that are central to autobiographical memory, such as visual imagery and belief in one's memory, and asks participants to report on the phenomenal characteristics of their autobiographical memories.

The second study used the cue-word method of eliciting autobiographical memories. This study was carried out to determine whether disputed memories could be uncovered without specifically prompting for them. In the third study a brief questionnaire was administered to non-twins to see whether they would also report having experienced disputed memories. The fourth study asked parents of twins to provide ten events from their twins' past. The twins were then asked to rate the memories on a shortened scale with an additional question asking them who the event had happened to. The fifth study asked six sets of twins from the first study to re-rate their disputed and non-disputed memories after a two-year delay.

## 1.11 Twins

Two types of twins exist, identical and fraternal. Identical or *monozygotic* twins are formed from one fertilized egg (one ovum and one sperm) which splits after conception into two identical halves that develop separately. Each identical child (always the same sex) will have the same chromosomes and many of the same physical attributes. Identical twins also share the same blood type, eye and hair colour. According to statistics (Koch, 1966) slightly more than half of all monozygotic twins are male. Fraternal or *dizygotic* twins are formed from two fertilized eggs and can result in two siblings of the same or opposite sexes. Monozygotic twins share the same genes and are basically clones of one another whereas dizygotic twins, although born at the same time, are no more similar to each other genetically than siblings.

Classification of zygosity is usually determined by several factors: physical resemblance, examination of blood groups, DNA testing or examination of the placenta (Koch, 1966). Physical resemblance comparisons are often used in twin classification. Comparisons are usually based on twins' similarity in genetically influenced characteristics, such as hair and eye colour and height and weight. This method shows approximately ninety-five per cent agreement with results from blood-typing analyses and DNA testing. Examination of blood typing involves comparing co-twins' similarity in red blood cell factors. When differences in any of the eighteen blood groups are found, twins are classified as being dizygotic twins. Twins may, however, have no detectable differences in blood groups but may still be fraternal. The most accurate method of twin typing is done by DNA testing which results in one hundred per cent accuracy. The last method that people use to determine twin type, and indeed the oldest, is examination of the placenta. For example, monozygotic twins share a placenta and dizygotic twins each have their own and the presence, at birth, of one or more placentas is a good indicator of zygosity. This however is not a foolproof method of determining zygosity as placentas can sometimes be fused in which case dizygotic twins could be incorrectly identified as monozygotic twins.

Twins, particularly monozygotic twins, are often used as participants in psychological research mainly in the field of behaviour genetics and trait personality (Carver & Schier, 2000). In investigating disputed memories, twins were initially used as participants as a starting point because 1) disputed memories have been observed anecdotally in twins, 2) twins often look similar to each other allowing for perceptual confusion in imagery within the twins, 3) twins look similar to each other allowing for perceptual confusions in others who might innocently implant a false memory, 4) twins are siblings of the same age and thus share an unusually large proportion of their histories, and hence have more chance to generate disputed memories, and 5) twins, particularly, monozygotic twins, tend to assimilate each other's personalities (Plomin, DeFries & McClearn, 1990) and react to their environments in a similar manner.

# CHAPTER 2

## Study 1

## RATING DISPUTED AND NON-DISPUTED MEMORIES

### 2.1 Introduction

The first experiment was conducted to establish whether or not twins do indeed experience disputed memories. Anecdotal evidence had suggested that they do but there was no literature available to support this claim. In a first attempt at empirical investigation of this phenomenon twins were simply asked directly whether they had experienced disputed memories with their co-twin. These memories were then compared with their shared non-disputed memories (i.e., shared autobiographical memories on whose ownership both agreed) using a questionnaire devised by Rubin, Schrauf and Greenberg (2001). This comparison was done to see if disputed memories differed in any way from non-disputed memories.

The scales used in the questionnaire are an attempt to measure many properties of autobiographical memory identified by theories of autobiographical memory at the same time. For example, in an attempt to assess the importance of belief in one's memory (Ross, Buehler & Karr, 1998) participants respond on a seven-point scale to the question "I believe the event in my memory really occurred in the way I remember it and that I have not imagined or fabricated anything that did not occur". Other items represent theoretical elements such as rehearsal, particularly spaced rehearsal which Bahrick (1979) suggested improved retention levels, episodic/semantic memory (Tulving, 1972), auditory and visual imagery (Reisberg, 1992), reliving of emotions (Christianson, 1996), and significance of the memory (Pillemer, 1998).

Each questionnaire contained 17 statements about the memory that were to be responded to on a seven point scale. In addition, respondents were asked how old they

were at the time of the event, and whether when they recalled the event they imagined it through their own eyes (field) or from the eyes of a spectator (observer).

## 2.2 Method

Forty people responded to newspaper advertisements for same-sex twins to take part in a study on autobiographical memory. The advertisement did not mention disputed memories. Thirty-one of these respondents were women and 9 were men. Respondents were given a description over the phone of what was meant by a disputed memory and each were given the following example: Two sixteen year old twins remember being at school and one of them was sent home for wearing too short a skirt. Only one of them was sent home from school but both twins claim to be the one who was actually sent home. The participants were then asked whether they had experienced a similar disputed memory. Of the original forty people who responded to the advertisement, twenty-five females and one male reported that they disputed at least one memory with their twin. Chi-square analysis showed that female twins were significantly more likely to report having disputed memories than male twins ($\chi^2 = 7.95$, df = 1, $p < .01$).

The 26 respondents who reported having experienced a disputed memory were asked to contact their twin to discuss the research and to think of as many memories as possible for which they believed ownership was disputed. Due to availability difficulties (it was not always possible to interview both of the twins) only nineteen sets of female and one set of male twins took part in the subsequent study. Ten sets of twins reported they were monozygotic (identical) and ten sets reported they were dizygotic (fraternal). Their ages at the time of the study ranged from 17 to 52 years with a median age of 24. Meetings took place at one of the twins' houses or in a meeting room at the university and both twins were present at the outset. Twins were asked to provide ten autobiographical memories in total - up to five disputed memories and the remainder memories that were shared but whose ownership was not in dispute. For example, if the twin pair had two disputed memories, they were then asked to provide eight non-disputed memories. For a memory to be included, both twins had to confirm that they had a clear recollection of the

event. The twins were then asked to come up with a one-sentence description of each memory beginning with the disputed memories. The interviewer recorded the one-sentence descriptions at the top of a separate questionnaire for each twin.

**Figure 2.1 Rubin, Schrauf and Greenberg (2001) Questionnaire**

1. As I remember the event, I feel as though I am **reliving** the original event.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

2. As I remember the event, I can **hear** it in my mind.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

3. As I remember the event, I can **see** it in my mind.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

4. As I remember the event, I or other people are **talking.**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

5. As I remember the event, I can feel now the **emotion** that I felt then.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly s if it was happening right now |

6. As I remember the event, I can recall the **setting** where it occurred.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

7. Sometimes people know something happened to them without being able to actually remember it. As I think about the event, I can actually **remember** it rather than just knowing that it happened.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as much as any memory |

8. As I remember the event, it comes to me in **words.**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as much as any memory |

9. As I remember the event, I feel that I travel **back to the time when it happened**, that I am a participant in it again, rather than an outside observer tied to the present.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as much as any memory |

10. As I remember the event, I comes to me in words or in pictures **as a coherent story** or episode and not as an isolated fact, observation or scene.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as much as any memory |

11. As I remember the event, I know its **spatial layout.**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

12. This memory is **significant** for my life because it imparts an important message for me or represents an anchor, critical juncture, or a turning point.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

13. I believe the event in my memory **really occurred** in the way I remember it.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| 100 % real | | | | | | 100 % imaginary |

14. Since it happened, I have **thought or talked** about this event.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as often as any event in my life |

15. Since it happened, I have talked about his event **with my twin**.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as often as any event in my life |

16. As I remember the event, I imagine it again through **my own eyes** seeing what I would have seen then, or as an **observer** from a different perspective that the one I had.

| 1 | 2 | 3 |
|---|---|---|
| own eyes | observer | can't tell |

17. To the best of your knowledge, is the memory of an event that occurred **once** at one particular time and place, a summary or **merging** of many similar or related events, or for events that occurred over a fairly continuous **extended** period of time lasting more than a day.

| 1 | 2 | 3 |
|---|---|---|
| once | merger | extended |

18. How old were you when the event happened _____ yrs old

19. Was there a **video** _____ **photo** _____ or **family story** _____ of this event

Once this was process was completed, each twin was given ten autobiographical memory questionnaires, one for each memory, and asked to complete them in isolation from each other. They were asked to consider each memory one at a time and to complete the questionnaires for the disputed memories first. For the disputed memories only, the twins were also asked six additional questions: 1. Who was present during the time the event took place. 2. What were you doing at the time the event took place. 3. How did you come to be at the scene where the event took place. 4. How old were you when the event took place. 5. What were you doing immediately before the event took place. 6. What were you doing immediately after the event took place.

### 2.3 Results

In total, the twenty sets of participants produced 33 disputed memories. Eight sets of twins reported having one disputed memory, eleven sets reported two disputed memories and one set reported three disputed memories. Brief descriptions of the disputed memories recalled by each of the pairs of twins are shown in Table 2.2 below.

**Table 2.2. Descriptions of disputed memories for each twin set**

| Twin Pair | Age Now | Age at Memory | Sex | Zygosity | Description of Event |
|---|---|---|---|---|---|
| 1.1 | 21 | 7.5 | F | Mz | One of us forgot to give dad a very important phone message |
| 1.1 | 21 | 5.5 | F | Mz | We were told not to touch an envelope on the dining table but one of us sealed it and got into trouble from dad |
| 1.2 | 52 | 5.5 | F | Mz | She ran away from home I searched for her |

| | | | | | |
|---|---|---|---|---|---|
| 1.3 | 19 | 11 | F | Mz | I was sleepwalking and walked into the dining room while dad was having breakfast |
| 1.3 | 19 | 19 | F | Mz | It was me who got my driver's license on my 19th birthday |
| 1.4 | 23 | 5 | F | Mz | We were playing with building blocks and my brother came over and knocked them over |
| 1.4 | 23 | 8 | F | Dz | I ran into a clothesline and cut my head |
| 1.5 | 24 | 14 | F | Dz | I went alone with my mother to pick up my friend at the coach station |
| 1.5 | 24 | 22 | F | Dz | It was my meal that was awful and had to be sent back to the kitchen |
| 1.6 | 17 | 10 | F | Mz | We both think we were the one who was sick and missed a week of school |
| 1.7 | 26 | 8 | M | Dz | We were playing on our bikes when our neighbour pushed me off my bike |
| 1.7 | 26 | 17 | M | Dz | He thinks he made a try-saving tackle in final but it was me |
| 1.8 | 42 | 6 | F | Mz | She thinks it was her but it was me who got the dolls' house as a gift |
| 1.8 | 42 | 12 | F | Mz | I was the only one who played in the school marching band |
| 1.8 | 42 | 12 | F | Mz | Mum and dad didn't know, but I (not her) was on the stairs watching a movie |
| 1.9 | 24 | 9 | F | Dz | We argue over who won a freestyle swimming race in a competition |
| 1.9 | 24 | 15 | F | Dz | We were getting a drink from the fridge and knocked over a jug of orange juice |
| 1.10 | 23 | 12 | F | Dz | I got smacked by a very strange girl who thought I was my twin sister |
| 1.11 | 23 | 10 | F | Dz | I had to have a wart removed, burnt off |

| | | | | | |
|---|---|---|---|---|---|
| 1.12 | 24 | 8 | F | Dz | I got a hot water bottle with rabbits ears on it for our birthday, hers didn't have rabbits ears |
| 1.12 | 24 | 14 | F | Dz | I caught a fish when we went on holiday in x, she says she caught it |
| 1.13 | 42 | 14 | F | Mz | I lost my sister's earring |
| 1.13 | 42 | 7 | F | Mz | We were in a dairy and I stole sweets from the shop and the man told our parents |
| 1.14 | 32 | 15 | F | Mz | We both say that we danced with x all night at the school dance |
| 1.15 | 26 | 2 | F | Dz | I had really bad chicken pox when I was young, she had it mildly |
| 1.16 | 18 | 9 | F | Mz | We argue over who won the spelling prize at school |
| 1.16 | 18 | 18 | F | Mz | At Nana's funeral I sat with mum and she sat in the pew behind with dad |
| 1.17 | 28 | 11 | F | MZ | I stayed alone in the tent after she went inside because she was cold |
| 1.18 | 46 | 6 | F | Dz | We disagree about who knocked over a huge plant and got in trouble |
| 1.18 | 46 | 6 | F | Dz | We always wore different colour clothing and it was me who had the yellow raincoat, she had the blue one |
| 1.19 | 25 | 10 | F | Mz | We were skiing together and I broke my ski and had to walk down the hill carrying my skis |
| 1.20 | 22 | 8 | F | Mz | She peeked at our Christmas presents and told me what they were |
| 1.20 | 22 | 10 | F | Mz | We were both in the same class but I felt sick and had to leave and threw up in the hallway |

[1] *Where the twins disagreed about their ages at the time of the incident means are shown.*

[2] *Twin sets are identified by numbers .1 through to .20 and 1 refers to Study 1.*

A Chi-square test ($\chi^2$ = 0.3, df=1, n.s.) indicated that zygosity did not affect the number of disputed memories the twins reported. The age of the twins when the events occurred varied from 5 to 22, with a median age of 10 years. Thus the incidents were recalled mainly from late childhood or adolescence. At one extreme, one set disputed a memory for an event which occurred six months previously, another set disputed the memory for an event which had occurred forty-six years before.

Attempts by two coders to classify the disputed memories failed to find any consistent themes in the events. The twins generally agreed on most of the details surrounding the event. Forty-five percent (15 out of 33) of the disputed memories were for events that occurred at home and fifty-one percent (17 out of 33) involved people other than the twins. Fifty-four percent (18 out of 33) of the disputed memories were over negative events and twenty-four percent were over positive events, the remaining events were neutral.

In total the twins reported 167 non-disputed memories which were elicited by free recall. The mean age of the twins when the incidents occurred that gave rise to the disputed memories was 12.5 years and that of their non-disputed memories was 11.9 years. Seventy-four percent of the disputed memories and 64 per cent of the non-disputed memories were recalled from the field perspective and a test of proportion showed no significant difference (at the $p < .05$ level).

Of the 33 disputed memories, 16 were recalled by both twins from their own field of view, 10 were recalled by one twin from the field and the other from an observer's point of view, and 7 were recalled by one twin from the field view while the other could not tell.

Table 2.3 below shows the mean ratings on the questionnaire items assigned to the disputed and non-disputed memories by the twins.

**Table 2.3. Mean and standard deviations of disputed and non disputed memories**

| | Mean disputed rating (SD) | Mean non-disputed rating (SD) | t-value |
|---|---|---|---|
| | Recollection | | |
| Reliving | 5.5 (1.10) | 4.7 (1.21) | 4.31 |
| Actually remember | 6.1 (1.08) | 5.7 (.98) | 2.62* |
| Travel Back | 5.0 (1.69) | 4.8 (1.20) | .82 |
| | Imagery and Emotion | | |
| Hear in Mind | 4.8 (1.66) | 4.3 (1.35) | 2.12* |
| See in mind | 6.0 (.82) | 5.3 (.91) | 4.81*** |
| Setting | 6.1 (1.18) | 5.7 (.99) | 2.52* |
| Spatial layout | 5.1 (1.52) | 4.6 (1.06) | 2.66* |
| Emotion | 5.4 (1.37) | 4.8 (.98) | 2.41* |
| | Language and Narrative | | |
| Talking in event | 4.5 (1.82) | 4.3 (1.30) | .87 |
| In words | 4.2 (2.05) | 4.1 (1.77) | .54 |
| Story | 4.7 1.65 | 4.8 (1.14) | -.26 |
| | Significance, Belief and Rehearsal | | |
| Significant | 4.4 (1.65) | 4.3 (1.36) | .46 |
| Occurred | 6.2 (.96) | 5.8 (.78) | 1.95 |
| Thought | 4.3 (1.76) | 4.1 (1.55) | 1.46 |
| Talked Twin | 4.6 (1.61) | 4.3 (1.11) | .88 |

**Notes**

Results of a two-tailed t-test (df = 19; random factor = sets of twins) are shown * $p < .05$; ** $p < .01$; *** $p < .001$. A similar t-test conducted using individuals as the random factors found the same 7 (and only 7) significant differences, although for "Actually remember the event", $p < .01$.

All variables are measured on a scale from 1 to 7 where 7 denotes more of the quality

The means shown in Table 2.3 show systematic differences between the types of memory. As noted earlier, many researchers have defined imagery as a central component of recollection (Brewer, 1996; Rubin, 1996; Tulving, 1983; Wheeler, Stuss, & Tulving, 1997). In this context it is important to note that the disputed memories were rated higher on many of the scales which attempted to assess either recollection (e.g., reliving, and remember versus know) or some aspect of sensory imagery (e.g., hearing, seeing, setting, and spatial layout). These memories were also rated to have a significantly greater real component, and as producing more of the emotion originally felt. In brief, although the memories must have been partially fabricated for at least half of the sample, the measures of memory quality provide no indication of this. All but one of the scales measuring recollection, imagery and emotional reliving were significantly higher for the disputed memories and none of the other scales were. The differences in recollection and in imagery and emotional reliving cannot be due to differences in perceived significance of the event, reported rehearsal, language in the memory, or narrative coherence. Of special note is the observation that the disputed memories are no less believed than the non-disputed memories even though both twins realise that one of them must be wrong. These observations are consistent with the reality monitoring literature in which increased imagery leads to greater belief in a memory (Johnson & Raye, 1981), but offers little encouragement to those who would use detailed imagery to separate 'true' from 'false' memories.

In order to examine whether the twins' similarity in rating the same memory was

higher for disputed memories a series of two-way analyses of variance was conducted to examine differences between ratings for each scale (for instance, reliving, hearing, seeing). This was done for disputed and non-disputed memories and for matched (the same or different) memories within twins. The twelve sets of twins who had two or more disputed memories were used for this analysis and only their first two disputed memories and first two non-disputed memories were used. The matched analysis compared the following for each variable: the first two disputed memories of each twin; and the first two non-disputed memories of each twin. For each variable, the unmatched analysis calculated the following statistics: the absolute value of (the first disputed memory of one twin minus the absolute value of the second disputed memory of the other) averaged with the absolute value of (the second disputed memory of one twin minus the first disputed memory of the other); the absolute value of (the first non-disputed memory of one twin minus the second non-disputed memory of the other) averaged with the absolute value of (the second non-disputed memory of one twin minus the first non-disputed memory of the other). Three effects were investigated: disputed memories vs. non-disputed memories; matched memories vs. unmatched memories; and the interaction. The disputed vs. non-disputed memories' effect was the only one which gave significant results for any variable and the three significant results are presented in Table 2.4 below.

**Table 2.4. Main effects for disputed vs. non-disputed memory types**

| Variable | Mean difference Disputed memory | Mean difference Non-disputed memory | F(1,11) |
|---|---|---|---|
| Reliving | 0.92 | 1.70 | 7.16* |
| Hearing | 1.38 | 2.00 | 5.95* |
| In words | 1.90 | 2.45 | 7.62* |

Note: * significant at the .05 level.

Although only three variables showed significant differences a trend was evident for disputed memories to have lower mean differences in ratings than non-disputed memories as well as an unsurprising trend for matched memories to have lower mean differences than unmatched memories. Interestingly there was also a trend for unmatched disputed memories to have lower mean differences than unmatched non-disputed memories. These results suggest that twins rate disputed memories in a similar way to each other, regardless of whether they are rating the same (matched) or different (unmatched) disputed memories.

The six open-ended questions asking each twin about their disputed memories were analysed to see if the twins, agreed, disagreed, or appeared to answer the question in different ways (for example, the twins sometimes answered the question "What were you doing immediately prior to the event?" in ways that suggested they had slightly different understandings of what "immediately" might mean in this context). This analysis was performed by 2 independent raters who achieved 82% agreement on their first coding and then resolved their differences by discussion. The twins agreed as to who else was present in 78% of the disputed memories and disagreed for 13% (The remaining 9% of the answers indicated a tendency to answer in different ways). 51% of the disputed events involved people other than their twin and 42% were over events involving both twins (the remaining 7% the twins disagreed over whether both of them were present) In answer to what they were doing they agreed in 94% of the memories and disagreed in 3%, they agreed as to how they came to be there for 78% and disagreed for 6%. They agreed as to their age at the time for 81% of the memories and disagreed for 9% of them. They agreed on what they were doing immediately prior to the event for 53% of the memories and what they did immediately after the event for 56% of them. Disagreements for these two questions were 19% and 22% of the memories, respectively. Thus there was good agreement on most aspects of the memory except who the protagonist in the event was.

Pearson correlations between the different rating scales were calculated separately for disputed and non-disputed memories, an analysis that was performed twice – once using different individuals and once using different memories as the data points. However,

neither the correlations themselves nor factor analyses based on them revealed any interesting oddities about the disputed memories.

## 2.4 Discussion

Anecdotal evidence had suggested that these memories existed and the results of this first study confirm the anecdotes and indicate the possession of at least one disputed memory is a relatively common occurrence in twins. The types of autobiographical memories that were disputed by the twins do not appear, in content, to be very different from their non-disputed memories. In particular, the disputed memories in this study were rated as having no more personal significance than non-disputed memories. In retrospect this may not be surprising as it would seem unlikely, for example, that one respondent could incorrectly claim their twin's memory of being hit by a car or getting straight A's in school, as independent verification would be relatively easy to find. Indeed, it is likely that twins have already resolved many of those that could be resolved and those that remain are over incidents where the protagonist cannot easily be identified.

One pair of 52-year old twins disagreed as to which of them made a dramatic attempt at running away from home the age of six years old. Both recall sitting in the back of the car whilst their mother frantically searched the streets for the missing twin. Both twins reported that they recalled turning a corner and seeing their twin sister in the distance carrying a suitcase. There are two unusual aspects to this disputed memory. First, of all the 33 disputed memories reported in this study this is the only one in which both twins recall their twin as being the protagonist rather than themselves. Second, an incident such as this would become part of a family's history so it seems unusual that a critical detail such as who actually ran away could be confused. Research has shown, not surprisingly, that unique or important events from our lives are better recalled than neutral events (Wagenaar, 1986), although, as Linton noted in her 1982 longitudinal study of her own autobiographical memory, an event's salience changes over time making the memory less accessible to recollection.

The twins who took part in the study were aware that one of them must have had a non-veridical recollection of the event they remembered, but it would be hard to pick this from the qualities that were ascribed to the memories. This is particularly evident in the high ratings on the various scales which assessed the imagery present in the memory and the vividness of it, which have been defined as central to autobiographical memory (Brewer, 1986). One might also note that both disputed and non-disputed memories were usually reported from the field perspective. Another interesting aspect to the ratings of the disputed memories was the confidence the twins had that the memory was indeed theirs. Previous research (e.g. Brewer, 1988; Gruneberg & Sykes, 1993) has generally found a good relationship between accuracy and confidence judgments of autobiographical memories. Laboratory experiments have also shown that belief is reliably related to accuracy (Tulving & Thomson, 1971; Wagenaar, 1986). Although the twins who took part in this study were aware that one of them has an erroneous memory for the event, neither twin was willing to concede that his or hers is the false memory. As previous research has shown, they are unwilling to "give up" their autobiographical memories, considering them to be true accounts of past experiences even when presented with contrary evidence (Hyman & Billings, 1995; Neisser, 1982; Neisser & Harsch, 1992).

The interpretation of the differences in qualia between the disputed and non-disputed memories in this experiment is somewhat unclear. Do, for example, disputed memories receive higher imagery ratings because memories that are more easily "seen in one's mind" are more likely to be disputed? Or do the disputes that the twins have had lead to more imagery, possibly as part of an attempt to assert one's ownership, possibly in part as a consequence of being asked about them by the experimenter? In theory, this issue might be resolved by firstly obtaining the imagery ratings and then later attempting to discover whether the memory is disputed, but the relative small number of disputed memories reported in this study would make this a difficult, if not impossible, undertaking.

One of the most intriguing aspects of this experiment was the relatively small number of disputed memories that the twins reported. Upon initial contact many of the

participants recognized the experience of disputed memories immediately and said they had had many arguments with their twin over events in their past. During the actual interviews, however, most twins could only recall one or two disputed memories. Indeed the participants often reported frustration that they could not recall any further disputed memories. One commented: "I can't believe this, I can't remember any more. We have had so many arguments over lots of memories. She is always stealing them from me and I get so mad!" Of further interest is that the disputed memories were discovered only when talking at a later date about the event the memory concerned, either between the twins themselves or with a third party.

As a first attempt at investigating disputed memories, Experiment 1 was successful. The twins who took part in this experiment were able to classify memories as disputed or non-disputed suggests that the distinction between the two is a meaningful one and open to empirical investigation. Despite the relatively low number of disputed memories each set of twins reported they all claimed that they had had many disputes over memories in the past. It appears, therefore, that disputed memories are a naturally occurring phenomenon which are discovered infrequently and often by accident. The anecdotal evidence from the participants who took part in this experiment supports this view and suggests details of disputed memories are hard to recall in much the same way that other unusual memory incidences such as déjà vu or tip-of-the-tongue phenomena would be.

As mentioned in Chapter 1, an important methodological issue concerns how disputed memories could be elicited. It could be argued that the disputed memories the twins reported were in part a result of demand characteristics placed upon the participants. The twins might, for instance, have wanted to take part in the study and, unconsciously or otherwise, have falsely claimed to have experienced disputed memories with their co-twin. It is also possible that the author communicated to the participants that she expected the twins to report having experienced disputed memories. It could also be argued that the higher ratings for disputed memories are merely a reflection of the twins' attempts to

convince themselves (or the interviewer) that the memory is indeed theirs. Whilst it is possible that the methodology was partly to blame for the higher ratings for disputed memories, such an account does not explain why ratings on certain scales, indeed scales that are central to theories of recollection, show significant differences while other ratings do not. In order, however, to examine whether disputed memories could be uncovered in a more ecologically valid way, and to see whether old, apparently non-disputed memories, might bring about disputes a second study was carried out using the cue-word technique and this is described in Chapter 3.

# CHAPTER 3

## Study 2

## CUED RECALL OF AUTOBIOGRAPHICAL MEMORY

### 3.1 Introduction

Francis Galton (1879) developed a method of unrestrained search in order to examine his store of episodic memories. His method involved thinking of a word until an association with that word was made. If that association referred to an event he recalled from his past he attempted to record and date the memory. The experimental method of cueing memories was revived by Crovitz and Shiffman in 1974 and has since become a valuable experimental tool. Studies using the cue word technique include: organisation of autobiographical memories (Conway & Bekerian, 1987), frequency of memories as a function of age distribution (Crovitz & Shiffman, 1974), and the retention of autobiographical memories (Rubin, 1982). Subjects are typically given a common word and asked to retrieve a memory associated to each word.

In Study 1 only twins who reported having experienced a disputed memory with their twin took part. Many of those participants, upon first contact, claimed to have experienced many disputed memories in their past. When they were asked to describe these memories *during* the experiment, however, they were often unable to recall many details of those disputed memories and could only come up with one or two disputed memories. This could have been an indication that they had experienced more disputed memories but simply could not recall the event the disputed memory concerned. This might be thought to be comparable to someone knowing that they had previously experienced déjà vu but not be able to report an actual episode. Thus, disputed memories might be relatively common experience but difficult to *find* simply by asking about them.

The cue-word technique was used in Study 2 for three main reasons: 1. To investigate whether disputed memories could be uncovered using a different methodology.

2. To counteract the effects that demand characteristics may have had on participants in Study 1. 3. To apply a traditional autobiographical memory research tool to a new area of memory research. The rationale behind this study, therefore, was that using forty cue words, and asking the twins together to come up with individual memories to each, would provide a good cross-section of autobiographical memories from which disputed memories might emerge.

A pilot study was first conducted with the author and her own monozygotic twin using general events from their past as cues to come up with specific events. In a tape-recorded session of two hours we both elicited memories from events such as summer camp, team sports, family holidays, birthdays, Christmases and school holidays. During that two-hour session no new disputed memories were elicited (despite our having experienced many disputed memories in the past). Interestingly though, hours later over dinner with friends, we (somewhat vehemently) disputed an event that occurred during summer camp, a general event category of memories that had been discussed at length during the pilot study. Even more surprising was that the event could be described as a pivotal moment, in this case, who experienced a first kiss while attending summer camp. Research has shown that these first-time memories convey significant information about the self and are often very vivid. Robinson (1992) proposed that first-time memories represent landmarks in our personal histories and are therefore an important category of general event that tend to be particularly enduring making this kind of memory dispute quite unusual. Although the pilot study was unsuccessful in eliciting any disputed memories Study 2 was conducted using twenty sets of twins using the cue-word technique and is described below.

### 3.2 Method

Twenty sets of same-sex twins (16 female) were recruited through advertisements in the local newspaper and by posters around the university. They had a mean age of 27 and median age of 20 (range 16-56). Upon initial contact they were told the study was about personal memory in twins and that they would be asked to provide autobiographical

memories to common words. They were then asked to contact their co-twin to arrange a convenient time when both of them could be interviewed together. Interviews took place in one of the twins' homes. After a few moments' introduction, permission to audio record the interview was obtained and recording commenced. The participants were briefly interviewed about their lives as twins and asked whether they were monozygotic or dizygotic twins. Two sets of twins reported that their zygosity had never been determined but that they had been raised to believe they were monozygotic twins and, given their striking similarity in appearance, were recorded as such. Eleven sets were monozygotic and 9 sets were dizygotic twins. After this informal interview participants were again told that the experiment was on autobiographical memory in twins and they were instructed to come up with a specific autobiographical memory of a childhood or early adolescent event (as a guide from between the ages of 8 and 12). The participants were asked to take turns providing the first memory for each cue-word. The forty words, selected to cue common events, were presented in different random orders and in cases where participants provided a general memory to a cue-word they were prompted for an event-specific memory. In cases where they were unable to come up with a memory to a given cue-word the next cue was presented. These sessions typically took between one and two hours. Some transcripts of the sessions are reproduced in section 3.3 of this chapter.

The cue words used for this study were: accident; birthday, being in trouble, fairground, church, picnic, sport, bicycle, car, swings, barbecue, Christmas, clothing, grandparents, restaurant, fireworks, boat, holiday, pet, first day at school, doctor, classroom, teacher, McDonalds, bus, cartoons, tricks, movies, bunk beds, parade, cake, train, assembly, chair, Easter, gym class, costume, tree, scouts / girl guides, books, homework.

### 3.3 Results

At least one disputed memory was reported for twenty-one of the forty cue-words. Brief descriptions of each of the 21 disputed memories are shown in Table 3.1 below.

**Table 3.1 Disputed memories elicited in Study 2 in response to cue-words**

| Twin Pair& Zygosity | Age Now | Age Then | Cue Word | Description of Incident |
|---|---|---|---|---|
| 2.1 mz | 21 | 5 | Bicycle | Both believe they were pushed off their bike by their cousins in Singapore. |
| 2.1 mz | 21 | 6 | Bicycle | Both claim to have the same recurring dream of Singapore during war |
| 2.1 mz | 21 | 5 | Swing | Both claim they swung across a pond on a vine and fell in pond getting very dirty |
| 2.1 mz | 21 | 6 | Accident | Both think they got a nail in their foot that went through their sandal |
| 2.1 mz | 21 | 11 | Barbecue | Both think they were asked to do a display dive at school during a school barbecue |
| 2.1 mz | 21 | 5 | Accident | Both think the other was chased by a nest of wasps |
| 2.1 mz | 21 | 8 | Christmas | Disagree about who discovered their presents in their parents' closet on Christmas Eve |
| 2.1 mz | 21 | 11 | Fair | Both think they came 12$^{th}$ in an international cross country race |
| 2.1 mz | 21 | 7 | Church | Argue over who disobeyed superstition and pointed at the moon during Chinese Festival |
| 2.1 mz | 21 | 12 | Clothing | Both think the other wore a terrible outfit and was caught by a boy they both fancied |
| 2.1 mz | 21 | 6 | Grand-parents | Argue over who got caned by their grandmother for something naughty that the other one did |
| 2.1 mz | 21 | 14 | Restaurant | Who went for lunch with their mum and had a worm in her meal which had to be sent back |
| 2.1 mz | 21 | 5 | Fire-works | Rabbit lantern catching on fire during Chinese |

| | | | | |
|---|---|---|---|---|
| | | | | Religious Festival |
| 2.1 mz | 21 | 12 | Boat | Argue over who was in boat with their father when they saw a tiger shark |
| 2.2 mz | 54 | 7 | Picnic | Disagree about who threw a sandwich away on a picnic when they were all hungry |
| 2.2 mz | 54 | 9 | Picnic | Disagree about which one of them used to habitually squish pound cake in their hands |
| 2.5 dz | 16 | 8 | Trouble | One of them got into severe trouble for something the other did |
| 2.6 dz | 20 | 8 | Accident | Argue over who got a nail in their foot |
| 2.6 dz | 20 | 8 | Accident | Both say the other ate half the contents of a mustard jar and was very sick |
| 2.6 dz | 20 | 5 | Birthday | Both think they got their ear glued to their head by a birthday party guest |
| 2.8 dz | 17 | 13 | Holiday | Disagree over who befriended a girl while they were on holiday who eventually became their best friend |
| 2.9 mz | 19 | 12 | Sport | Both think it was their name that their rugby coach got wrong during an important match |
| 2.10 mz | 17 | 5 | Pet | Both think the other twin used to grab their dog by its testicles |
| 2.11 mz | 17 | 9 | Car | Argue over who, on a trip in a car, threw up over everyone |
| 2.11 mz | 17 | 5 | 1st day at school | Argue over what each other wore during their first day at school |
| 2.12 dz | 21 | 7 | Sport | Argue over who played goal attack during a game of Kiwi netball which they won |
| 2.13 dz | 19 | 6 | Birthday | Disagree about who got a particular present that they both loved |

| | | | | |
|---|---|---|---|---|
| 2.13 dz | 19 | 10 | Car | Disagree as to who was in the back seat of the car during accident and saw the car hit them |
| 2.14 mz | 16 | 9 | Fair | Disagree about who went on a roller coaster at a fairground when they were both really scared |
| 2.16 mz | 54 | 8 | Accident | Disagree about who fell over when a wheel came off roller skate |
| 2.16 mz | 54 | 10 | Birthday | Both think they were the one not invited to a friend's birthday party |
| 2.16 mz | 54 | 7 | Birthday | Disagree about whose head got dunked in water when bobbing for apples |
| 2.16 mz | 54 | 8 | Trouble | Both say the other was the one who stole lollies from a shop |
| 2.18 dz | 29 | 9 | Trouble | Argue over who got into a fight in the playground at school |
| 2.19 mz | 56 | 13 | Doctor | Both think they fell off a tractor and sprained their wrist |
| 2.19 mz | 56 | 8 | Church | Both think the other got in trouble for throwing things in Church |

Notes: The numbers in the first column indicates twin pairs 2.1-2.20 and whether they were monozygotic (mz) or dizygotic (dz) twins.

The twenty sets of twins reported thirty-six disputed memories in total. Fourteen twins disputed at least one memory with their twin and 6 had no disputed memories. The mean number of disputed memories reported was 1.8 (range 0-14) and the age of the twins at the time the event occurred varied from 5 to 14 with a median age of 8 years.

The cue-words "accident" produced five disputed memories, "birthday" produced four disputed memories, "being in trouble" elicited three disputed memories, "fairground", "church", "picnic", "sport", "bicycle" and "car" elicited two disputed memories and "swings", "barbecue", "Christmas", "clothing", "grandparents", "restaurant", "fireworks",

"boat", "holiday", "pet", "first day at school", and "doctor" each produced one disputed memory. No disputed memories were reported for the cue words: "classroom", "teacher", "McDonalds", "bus", "cartoons", "tricks", "movies", "bunk beds", "parade", "cake", "train", "assembly", "chair", "Easter", "gym class", "costume", "tree", "scouts / girl guides", "books" and "homework".

One of the more interesting results of Study 2 was how many new disputed memories were discovered during the experiment. Of the 36 disputed memories, 21 were discovered to be in dispute during the experiment while only 15 were known to be disputed prior to the experiment. Table 3.2 shows the distribution of new and old disputed memories together with a rating of whether the disputed memory was for a negative, positive or neutral event.

**Table 3.2. Number of new and old disputed memories**

| **Number of Disputed Memories** | **No of twins** | **Old Dispute** | **New Dispute** | **Positive** | **Neutral** | **Negative** |
|---|---|---|---|---|---|---|
| 0 | 6 | - | - | - | - | - |
| 1 | 7 | 4 | 3 | 2 | 3 | 2 |
| 2 | 4 | 3 | 5 | - | 3 | 5 |
| 3 | 1 | 2 | 1 | - | 1 | 2 |
| 4 | 1 | 2 | 2 | - | - | 4 |
| 14 | 1 | 4 | 10 | 2 | 3 | 9 |
| **Total** | 20 | 15 | 21 | 4 | 10 | 22 |

Note: Two independent raters judged whether the memory was for a positive, neutral or negative event and achieved 89% agreement in the first instance and differences were then resolved by discussion.

Unlike Study 1, where in all except one disputed memory the twins saw themselves as the being the protagonist, the participants in Study 2 reported that their twin was often the protagonist in the event. This could be due to both the shift in methodology and the fact that 21 of the 36 disputed memories in this study were new disputes as opposed to Study 1 were all 33 disputed memories were known to be in dispute prior to the study. Table 3.3 below shows a distribution of the memories as to whether the twins saw themselves as the protagonist in the event the memory concerned or their twin was the protagonist. Table 3.4 below shows the distribution of the memories by gender and zygosity.

**Table 3.3 Disputed memories by twin type and who they saw as the protagonist in the event.**

| Twin Type | No of DMs | Themself as Protagonist | Their twin as protagonist |
|---|---|---|---|
| MZ-Female | 23 | 16 | 7 |
| DZ-Female | 9 | 8 | 1 |
| MZ-Male | 4 | 2 | 2 |
| DZ-Male | 0 | 0 | 0 |

**Table 3.4 Total number of disputed memories by zygosity and gender**

| Number of Dms | MZ | DZ | Female | Male | All |
|---|---|---|---|---|---|
| 0 | 3 | 3 | 5 | 1 | 6 |
| 1 | 3 | 4 | 5 | 2 | 7 |
| 2 | 3 | 1 | 3 | 1 | 4 |

| | | | | | |
|---|---|---|---|---|---|
| 3 | 0 | 1 | 1 | 0 | 1 |
| 4 | 1 | 0 | 1 | 0 | 1 |
| 14 | 1 | 0 | 1 | 0 | 1 |
| **Totals** | 27 | 9 | 32 | 4 | 36 |

*Chi-square analysis performed on both gender and zygosity showed no significant differences in the number of disputed memories the twins reported.

At the extremes six sets of twins had no disputed memories during the cue-word study and one set of twins disputed fourteen memories. The rest of the sample disputed between one and four memories.

### 3.4 Qualitative Analysis

The quantitative analysis carried out in Studies 1 and 2 provides information about the disputed memories. But the disputes themselves are really the *star* of the research and warrant a qualitative analysis. Verbatim transcripts of all the memories that were disputed are therefore reproduced below as well as transcripts of some of the non-disputed memories matched on cue-words. Transcripts of the non-disputed memories are reproduced in order to provide the reader with a comparison between disputed and non-disputed memories.

The transcripts, although long, are included to give the reader some idea of how the memories are actually disputed and what they are. Each set of twins is introduced separately and is referred to as Twin Set 2.1 through to Twin Set 2.20 and the age and zygosity of each twin pair is indicated. The cue word to each disputed memory is also given. In each of the transcripts the twins are referred to as 1 and 2 to differentiate who was speaking (eg. 2.1.1 and 2.1.2) and "I" refers to the interviewer. Asterisks are used in place of participants' names in order to protect their identities. It is important to note that although the transcripts are verbatim it is impossible to convey the level of non-verbal communication between the twins during the exchanges which, at times, got a bit heated!

### 3.5 Transcripts of all disputed memories

**Twins 2.1 - 24 yr old female monozygotic twins**

**Cue-word Bicycle**

2.1.1 I remember when I fell down off my bike when I was really young, I was learning how to ride down a hill and I was being pushed and I jumped off, I must have been about five or maybe a little bit older....

2.1.2 Hey, I am sure that happened to me because....wait I'm pretty sure that happened to me, and we had all of my cousins, I had all of my cousins around me and we were like um, you were there too, we were at the Campong, this was in Singapore, and it was like a little hilly, not much of a hill but a little bit of a hill and I got on the bike and some of my cousins were pushing me along and they grabbed the handlebar and I fell over.

2.1.1 This is really weird because, I don't know if you are interested because it wasn't from high school but from when we were really young, about five years old I would say, and I swear the same thing happened to me, because I fell over and I hurt my knee and it bled lots, and I cried and stuff and there was lots and lots of blood

2.1.2 We had all our cousins around

2.1.1 We grew up around lots of kids and stuff and, I don't know, I swear it happened to me.

2.1.2 Well, it could have happened to both of us

2.1.1 Yeah, but it is so specific the same thing could not have happened and I remember have a really scabby knee, and it bleeding and stuff like that and crying

2.1.2 Well, I don't remember you falling off your bike but I remember me falling off my bike.

2.1.1 Well, I remember me falling off my bike but I don't remember you falling off your bike, but I do distinctly remember that we had a bike to share.

2.1.2 And it wasn't like ours, it was like, our cousins and that is how we learnt to ride them

**Continuation from Cue-word Bicycle**

2.1.1: This is one thing that really annoys me, when I was young I had this recurring dream and it was of Singapore during the war and we were in tunnels with our family and it is just real dark and you can hear the sound of crying and there are two twins in the dream as well and ** thinks it is her dream

2.1.2: (Laughs), it is my dream

2.1.1: It really bugs me because this is a dream I have had probably up until the age of six or seven and I used to really annoy her because she would talk about this weird dream of hers but I'm sure she has never dreamt it

2.1.2: I have dreamt it, and it is my dream

2.1.1: See, we are very argumentative twins aren't we. You probably haven't met twins who argue as much as we do.

**Cue-word Swings**

2.1.1: We have another one like this too, this is again when we were really young, we had like a vine, this is when we were growing up in Singapore, that swung across a pond and ** claims that she actually swung across it and fell into the water.

2.1.2: Which I definitely did

2.1.1: Which she didn't coz that was actually me

2.1.2 ** thinks she did

2.1.1: But we've argued about this for absolutely years, I always say I swung across that bloody vine

2.1.2: No I did

I: So you don't think it could have happened to both of you

2.1.1: No it was definitely just me

2.1.2: No it wasn't because I remember being muddy

2.1.1: Well I do too and also remember distinctly being very muddy being very worried that mum was going to be very angry

2.1.2: I think it's transference, I think ** is confusing the memory when she fell into the pond and she had on a really nice frock

2.1.1: I did not

2.1.2: She was a bit worried about that and I think she is just confused

2.1.1: No, I'm not they were two separate instances.

2.1.2: Hmmmm

**Cue-word – Barbecue**

2.1.1: We had lots of barbecues, I remember we had barbecues when we had like swimming events and stuff

2.1.2: I remember one

2.1.1: This is like at High school

2.1.2: No, this was

2.1.1: Yeah, we had them at Lincoln High but I particularly remember one when, I'm sure it was me but I'm not sure if you'll agree, but when I was picked to dive (gets interrupted) …what…It was me

2.1.2: Carry on

2.1.1: I was picked to dive and it wasn't at the Fernleaf pool it was the other one we used to go to

2.1.2: Yeah, the one where we scuba dived in

2.1.1: Yeah, and then someone had mistaken the fact that I scuba dive thinking that I dived as in off the springboard……

2.1.2: No that wasn't you, that wasn't you

2.1.1: No that was definitely me because I did a belly flop dive and don't think you did because you actually wouldn't get up on the plank because you were always scared, you never dove

2.1.2: I am sure I did

2.1.1: You never dove off that thing **, no sorry, sorry

2.1.2: No… I am sure that I did – it wasn't a belly flop, it was a good dive

2.1.1: NO, that is such a lie, in fact I think it was me who had to do the dive

2.1.2: Well maybe we both did but I am sure I did it because I was really scared and it was really high and I remember that very well, I scuba dived

2.1.1: Well I don't remember you diving from the dive board so

2.1.2: I think we are going to have a big argument after this. I remember me distinctly doing it and I don't remember you doing it

2.1.1: I remember it well, do you remember me doing it because I don't remember you doing it

2.1.2: No, maybe we were both really self-centred children and ignored each others existence...

2.1.1: I remember like being really scared and diving off it

2.1.2: Yeah I remember being really really scared too and humiliating myself...you know being very humiliated because I did a belly flop

2.1.1: Well you did that a couple of times at school

2.1.2: No, I didn't it, it was the one and only time, like when had to recite that poem and you burst into tears,

2.1.1: Yeahh

2.1.2: That was you,

2.1.1: Yeah, we are talking about being humiliated and shy, I've humiliated myself many times at school, but who doesn't, but that diving thing ....

2.1.2: Do you remember, remember, being part of the, swimming at the Fernleaf, this is when we were young again, probably 6 or 7, 7 or 8 and we had that swimming club and Mr Walsh was in charge of like the number one swim team

2.1.1: Yeah, yea

2.1.2: Do you remember that

2.1.1: Yea

2.1.2: And did you ever swim under water, like for a whole length and back

2.1.1: No, you did it, you were better than me

2.1.2: I'm just, you know, making sure

2.1.1: It seems like most of the things we disagree with seem to be from when we were seven and younger

2.1.2: Yeah, although you seem to think there is stuff that you did in Auckland that I said I did, but I can't remember

2.1.1: That is what I was trying to think, coz I spent a year in Auckland

2.1.2: This is when we were 18

2.1.1: Yeah, and I'm sure I told, like, my sister about some of the things I did, I can't actually recall what it was, and she used to tell people that she did and it used to really annoy me

2.1.2: I can't remember that, coz I was living here so it doesn't make sense to me that I would do that.

2.1.1: It was social things, like social situations and so forth, which could have really taken place, like it wasn't specific to Auckland, just like little experiences but I can't actually think of what they were at the top of my head

2.1.2: No…

**Cue-word Accident**

2.1.1: Do you remember like when I got a nail in my foot when I was running around

2.1.2: I got a nail, I got a nail in my foot

2.1.1: No you didn't

2.1.2: I did, this was in Singapore

2.1.1: Yep,

2.1.2: I definitely got one in my foot,

2.1.1: This was like when we were real young

2.1.2: Was it like, from a box

2.1.1: I don't remember but remember getting a nail in my foot

2.1.2: Well I do too

2.1.1: We can't have both got one, what are the chances

2.1.2: Well I'm sure I am the one who got the nail in my foot and I was playing

2.1.1: And it actually went through the jandals (type of shoe)

2.1.2: Yes

2.1.1: No I remember that and I swear it happened to me

2.1.2: No, it happened to me and they were pink jandals, or green jandals

2.1.1: Well I don't know but it was from a wooden box with nails in it

2.1.2: It was definitely wooden but it wasn't a box, it was just a piece of wood lying around and it was in a building next to one where we lived

2.1.1: I don't remember that but I remember it definitely happened to me and I got the nail through my foot and this happened in Changi village

2.1.2: Yeah, No, NO

2.1.1: And it went straight through my jandal

2.1.2: No I got the nail in my foot, I think I have the scar there to prove it

2.1.2: Well I don't have a scar but I know it happened - there you go, we have another one to fight over later

2.1.1: And how about when the cat scratched you up

2.1.2: Yep

2.1.1: Good, at least you remember that one right.

**Continuation of Cue-Word Accident**

2.1.2: Yep, that happened to me, and the wasps stung you didn't they.

2.1.1: No, no they stung you

2.1.2: No I'm pretty sure they stung you

2.1.1: Because you were allergic to wasp stings and stuff

2.1.2: No I don't remember, I remember you getting chased by the wasps

2.1.1: Are you sure about that

2.1.2: I remember you being stung 7 times by wasps

2.1.1: I'm sure she got stung

2.1.2: You got really swollen, like it wasn't me, I'd remember be stung by wasps

2.1.1: It happened quite close to when you got scratched by the cat coz I thought Oh My God, that's such bad luck coz you got scratched by a cat and then stung by wasps

2.1.2: It was actually a wild cat and it scratched my wrists up real badly and I was young

2.1.1: I remember one of us being stung by wasps, and I don't remember it being me I remember it being you

2.1.2: I remember it being you and not me... I don't know, we need our mum to qualify

I: Do you think your mum would be able to sort these out

2.1.2: I don't know, she might be able to – we confuse her – actually a lot of our relatives get confused too, they don't really know which is which and is probably why still argue about the same memories coz they can't remember who did it... coz actually when we were very very little we were very identical and if you see pictures of us we even can't tell which one was which

2.1.1: Yeah... no other accidents...

**Cue-word Christmas**

2.1.1: I remember looking in the wardrobe in my mum's room and seeing all these presents and on Xmas day it said they were from Santa and that is when I realized that Santa wasn't real

2.1.2: I remember looking into the wardrobe too and seeing it

2.1.1: I showed you?

2.1.2: I don't know if you showed me but I remember actually definitely seeing it by myself

2.1.1: I remember seeing it by myself

2.1.2: Coz we were definitely not together when we saw it

2.1.1: No

2.1.2: And it was the teddy bears

2.1.1: Yeah, it was

2.1.2: And they were sitting there, there were two teddy bears and they were identical

2.1.1: Coz I remember that memory very very clearly

2.1.2: I do too, but you weren't definitely weren't there

2.1.1: You weren't there as well, unless we both discovered it separately, or unless you told me about and then I went and saw it, I don't know but I definitely remember seeing it

2.1.2: I do too

2.1.1: Coz that ruined Christmas for me

2.1.2: Well I don't think I would have told you if I knew that Santa Clause wasn't real

2.1.1: Yeah you would

2.1.2: But you would have thought, coz I really don't remember you being there, you would have thought that if one of us had told we would have both been looking together at one stage

2.1.1: I don't know, but I remember that really really clearly, coz I remember saying to mum and dad if this is from Santa Claus what was it doing in your closet, do you remember?

2.1.2: No

2.1.1: And then dad made this feeble excuse that Singapore was too hot for Santa so he had to give presents to dad and he would give them to us…

**Cue-word - Fairground**

2.1.2: Do you remember running cross-country and I came 12th

2.1.1: Ahhh, No I remember running cross-country

2.1.2: Oh No

2.1.1: This was the international one

2.1.2: That was the one you got annoyed with me because I was always slower than you but I beat you

2.1.1: No, no, that was the one I came 12th

2.1.2: No

2.1.1: And the one that I got annoyed with you for was the one that one that, in Form 2, when I came first and you came second and you didn't do any training

2.1.2: No, I'm thinking of specifically

2.1.1: The international cross-country

2.1.2: No it wasn't the international this was just the one for the school, I don't think it was the international one

2.1.1: No, well which school was this

2.1.2: NZ 4 School, the prelims

2.1.1: NO, coz I remember the best cross country run that I ever did was like in a really, I don't know if it was international or was it like a big school thing, but I definitely came 12th

2.1.2: It was the big school thing and I came 12th, it wasn't the international

2.1.1: I used to run more than you

2.1.2: Yes you did run more than me, but, I came 12th and you were annoyed with me, I'm sure of it

2.1.1: No I was annoyed with you for something else and I definitely came 12th in that one

I: So you think you are talking about the same race at the same school

2.1.1: Yes

2.1.2: Definitely – if it was at NZ 4 School, and it was against people heaps older than us

2.1.1: Yeah, that's it coz I used to run heaps more than you

2.1.2: I know that is what made you so angry when I came 12th

2.1.1: Anyway,

2.1.2: I am sure I came 12tth – I was always annoying her because she was always that little bit better than I was and whenever I beat her it used to really annoy her

2.1.1: No I definitely

2.1.2: I never put as much training into anything....

2.1.1: There was something I was going to say but I have totally forgotten, I'll probably remember it later

**Cue-word - Church**

2.1.2: We never went

2.1.1: We never went

2.1.2: Well how about the temple

2.1.1: We were brought up as Buddhists, not Christians

2.1.2: Do you remember being given those little triangle things

2.1.1: Yeah

2.1.2: And we cut it open, it was like a protective thing, to see what was in it and it was like a nail and a bit of paper

2.1.1: Do you remember Dad made us throw it out

2.1.2: Do you remember, when we were really superstitious growing up, Chinese people are really superstitious, and when I totally refused to point at the moon because I

thought something funny, like you got a cut on your ear, and so I pointed at the moon, and I think dad made us as a joke

2.1.1: No that was me

2.1.2: He grabbed my hand,

2.1.1: That was me

2.1.2: And I got a cut on my ear

2.1.1: No that was me ** – because I remember because he thought it was so funny and he grabbed my hand and made me point at the moon

2.1.2: No he grabbed my hand

2.1.1: And I got a cut on ear – it wasn't you

2.1.2: We would have been 7 - maybe it happened to both of us, because you were definitely there, but what the are the chances that both of us got cuts on our ears from pointing at the moon…

I: So you both had cuts on your ear

2.1.2: That did not happen to you coz I remember a whole lot of struggling trying to put my hand back

2.1.1: Yeah, I remember that and I remember you were definitely there, it was you, me and dad

2.1.2: Yeah

2.1.1: Yep, but I remember me doing it and I got a cut on my ear which bled

2.1.2: No you didn't do it, it was me and my ear bled, you were just standing on the side

2.1.1: I'm sure that was me

2.1.2: No I'm sure that was me

2.1.1: No

2.1.2: Well maybe it was both of us

2.1.1: Yeah, right – I think there is a bit of transference here,

2.1.2: Do you see how ** always thinks it's her when really it is me

2.1.1: You think it is so you all the time

2.1.2: Yeah, and I think you think it is always you, but I'd swear that happened to me

2.1.1: No it didn't, we're going to have to claim our stories ** – we'll have to divide them up

2.1.2: I remember when I lost mum on the way to the World Trade Center, and I cried and cried

2.1.1: And then she turned up, she had gone shopping when she was supposed to look after the kids,

2.1.2: Yeah, do you remember going to the olive plantation...car racing I wanted to make sure that you knew for a fact that it was you..

2.1.1: Yeah, no I remember that it was me

**Cue-word – Clothing**

2.1.1: I told you that story the other day, you didn't remember this story at all, I heard Shawn say he ran into you in Whangerai and you were wearing clothes that I would wear, you were wearing a dress, and a backpack on and you had lace up shoes, with ribbons in them

2.1.2: No that was not me

2.1.1: And I remember thinking

2.1.2: I don't know why you think that that's me coz it was you

2.1.1: That was weird because I swear that you know, he said that he ran into you doing it and I was like, oh well you know that is really interesting but yeahh, it was really weird.

2.1.2: Uh, we used to go op-shopping in 7$^{th}$ form and you used to tell everyone you were the op-shopper but I was actually the one who did the op-shopping

2.1.1: Yeah, that's true – I just borrowed your clothes

**Cue-word – Grandparents**

2.1.2: I remember our grandmother used to walk us to the kindergarten and back

2.1.1: And she used to piggy-back us when were tired

2.1.2: And I remember she used, she used to give you little smacks on the bottom more than me coz you were a really horrible child

A: Yeah, I used to get smacked all the time

2.1.2: ** was very very naughty

2.1.1: I remember when I got caned once

2.1.2: I got caned

2.1.1: You didn't – you never ever got caned

2.1.2: I got caned in the legs for something that you did probably

2.1.1 No I'm sure that wasn't it I got caned for something I did

2.1.2: By grandma?

2.1.1: Yeah

2.1.2; This was outside

2.1.1: Yeah

2.1.2: On the leg

2.1.1: Yeah, on the leg

2.1.2: I was definitely caned as well

2.1.1: No you weren't

2.1.2: I'm sure I did

2.1.1: You never got caned

2.1.2: I was grandma's favourite.

2.1.1: I remember when mum sent a box of chocolates, did I rip the box up, I don't know, I had a temper.

I: So you don't think it was both of you who got caned

2.1.1: I had a temper, it was definitely me

2.1.2: No it was me

2.1.1: No I was caned, coz it hurt and it was the one and only time I was ever caned and it was by grandma and

2.1.2: That was the one time I was ever caned and it was because I wouldn't have been found out but Alyong told

2.1.1: I think it was because Alyong told on me – only one person was caned, I remember that because I was very resentful that I got punished for something that you did as well and it was because Alyong told on one of us

2.1.2: No, I remember coz I got punished for something you did

2.1.1: No, I distinctly remember being caned by grandma

I: Could anyone verify this

2.1.1: No she is old now and couldn't remember

2.1.2: Do you remember hiding under the bed when mum came to visit

2.1.1: Yeahh

**Cue-word – Restaurant**

2.1.1: I remember, and I am sure it was just me and mum, and she ordered noodles and I think it was, oh, it was at Johans in Singapore, and it had, like a worm in it.

2.1.2: No that was me

2.1.1 It was me

2.1.2: No it was me, because you went to school that day and I was sick and mum took me shopping with her at Johan's

2.1.1: Well I don't remember the reasons why it was just me and mum, but sometimes we would just

2.1.2: No...and she was really cross and she took it back, I remember that

2.1.1: I remember that

2.1.2: No ** you weren't there because you were at school

2.1.1: No

2.1.2: Coz I distinctly remember looking at her plate and seeing a worm,

2.1.1: And I was sick so I went shopping with her, it was a school day, and I was home and mum didn't have anyone to look after me, and she was a shopaholic, so she thought she would take me with her

2.1.2: You might have all these details but I am sure it was me, coz like I remember like seeing the worm,

2.1.1: No you didn't

2.1.2: No, and you make me feel like a dork, but I am sure it was me and that it was a worm in her food

2.1.1: Coz I remember ordering scallops

2.1.2: Yes, I had scallops, little blue scallops, I remember that

2.1.1: You weren't there, it was me, and I remember feeling really pleased because it is not often I get mum to myself and I was sure I was going to get spoilt

2.1.2: (Laughs) No

2.1.1: Coz I was sick

2.1.2: I don't think it was you, I am pretty sure it was me coz I can remember seeing the worm.

2.1.1: I don't actually remember seeing the worm, but yeahh..

2.1.2: Who shall we believe....you might remember all these background details, which I don't, but I remember seeing the worm in her plate which you don't

2.1.1: It was a plate of noodles

2.1.2: Yeahh, and I had scallops

2.1.1: What kind of noodles

2.1.2: **, I think it was ho fun, it was like fried

2.1.1: It was fried, like Singapore ho fun, and I definitely remember that

2.1.2: I don't remember what sort of noodles

2.1.1: I know my noodles

2.1.2: No, sorry, that is enough of this, coz I remember this quite distinctly

2.1.1: See we told you we argue a lot!

**Cue-word - Fireworks**

2.1.2: We don't have a fireworks memory, but do you remember the lantern festival and when my rabbit lantern caught on fire and I was real upset

2.1.1: My rabbit lantern caught on fire and I was really upset

2.1.2: No it didn't ** it was mine

2.1.1: I had a rabbit lantern and it caught on fire and I was really upset

2.1.2: We both had a rabbit lantern, mine caught on fire, yours didn't

2.1.1: Yes I know that we both had a rabbit lantern but it was mine that caught on fire and I was really upset

2.1.2: NO, no, no no. In Singapore there is this thing called a lantern festival and all the little kids have these little lanterns and you light it up and put a little candle in them and you carry them

2.1.1: Yeah, and the wind caught it

2.1.2: And we both had little rabbit ones cause we were born in the year of the rabbit, and you usually buy, you know, whatever, if you're a dragon you buy a dragon, so I remember mine definitely like,

2.1.1: The cellophane rabbit?

2.1.2: Yeahh

2.1.1: The little white one with little flowers on it, then it was definitely me cause I remember seeing it burning on the ground and stuff

2.1.2: ** mine caught on fire and yours didn't, that is what upset me

2.1.1: Mine caught on fire

I: Do you know that only one of them caught on fire

2.1.2: Yes

2.1.1: Because the other one was still intact and I wouldn't have been as upset if that whole competition twin jealousy thing…

2.1.2: It was definitely only one that caught on fire and I am sure it was mine

2.1.1: No it wasn't, coz I was upset

2.1.2: Well, I'm sure it was mine

I: Were you holding it at the time

2.1.1: Yes, we were walking along the road holding it

2.1.2: I don't remember holding it, I just remember seeing it burning on the ground

2.1.1: Walking along the road holding and the whole thing just puff,

I: How old were you

2.1.1: Four or five

2.1.2: Four or five old enough to walk with it but still a bit clumsy

2.1.1: That was mine sister, if only they didn't get us the same bloody lantern, then we'd know wouldn't we….

**Cue-word – Boat**

2.1.1: We had a boat, we had heaps of boats, we were like a boating family

2.1.2: Remember the rubber boat, dad use to

2.1.1: This is in Thailand when we were on holiday

2.1.2: Oh yes, he used to row us out and chuck us in the water and we had to swim back to the beach and stuff like that

2.1.1: I hated that rubber boat I wished holes on it

2.1.2: I didn't like swimming in the ocean very much

2.1.1: I remember we came back from that trip in the boat and it was really stormy and we had to have wetsuits on coz we were getting drenched and it was really cold and it took two hours to get home and it was usually a 45 minute boat ride

2.1.2: You couldn't have had a wetsuit on coz you didn't have one

2.1.1: I had a top on you had the bottom on, coz I borrowed yours

2.1.2: Maybe

2.1.1: I remember seeing the shark, do you remember seeing the shark on the bum boat

2.1.2: Yeah, the Tiger Shark, no, no you didn't see it because I was like hanging out with dad and he pointed it out and it was a Tiger Shark and

2.1.1: It was me who saw it and it was actually quite big and it swum by the side of the boat

2.1.2: Yeah, but I don't think that you saw it because it was just me and dad

2.1.1: I saw it

2.1.2: No, I don't think you did because it was just there just for an instant and then it kind of just disappeared somewhere

2.1.1: No I was there

2.1.2: No, I am sure you weren't I am sure it was just me and dad

2.1.1: No,

I: (To 2.1.1) Who do you remember being there?

2.1.1: I think ** was there, like I actually gave up diving before she did, I totally believe that it was me

2.1.2: Well did you see the man'o'war another time?

2.1.1: No, I didn't see that,

2.1.2: Well, Ok, I distinctly seeing the shark by the side of the boat, and you weren't there, but that actually doesn't make sense, because you should have been there

2.1.1: Yeah, exactly, I was the one who dived, so you are wrong, you've got my memories

2.1.2: It is possible, coz I can't understand why I would be on a boat with dad there, without you there, since I didn't dive, but I so remember seeing this shark, it is so vivid, oh well never mind

2.1.1: Is it

2.1.2: Definitely, it is really vivid, I can actually picture it in my mind now, the side of the boat, the fin sticking out of the water, hot day, really really hot day…

2.1.1: ** came to see us for lunch

I: So who was there

2.1.2: Actually, I don't think I was in all honestly, I don't honestly think I was because it doesn't make sense logically but I remember it so well, this is weird

2.1.1: I probably told you about it and you could really really imagine it and stuff I'll keep this one

**Twins 2.2 – 53 yr old Monozygotic Female Twins**

**Cue word – Church**

2.2.1: Walston?

2.2.2: Yeah, it was a girls' rally, you know, run by a church

2.2.1: And we used to get hot cocoa

2.2.2: And I remember we went on this picnic

2.2.1: It was a church, yeah

2.2.2: And mum made tomato sandwiches for us and we went up to where the Sign of the Takahe is to have our picnic up there, none of us liked the tomatoes

2.2.1: No there was one left, there was one sandwich left

2.2.2: Oh was there

2.2.1: Yeah, there was Lynn, there was you and there was me – and Lynn wanted it, you wanted it and I wanted it, and I don't know who it was but one of us picked it up and just went like that (throwing gesture)

2.2.2: Now I thought that was something different, I thought we were sitting there I remember you and Lynn and me and there was one sandwich left, nobody like tomatoes, so what we did was took the tomato out and threw it over the bushes and ate the bread I thought that is how it went

2.2.1: I remember it was screwed up

2.2.2: ** used to love screwing things up

2.2.1: No it was you, you and madeira cake you used to always

2.2.2: Oh no, no it was you because

2.2.1: ** used to like the ...uhm because on a Friday mum used to bring us fish and chips 9 pence worth of fish and chips and that was a real treat – you know how it was wrapped up, we used to make a hole in the middle

2.2.2: And mum used to cut our lunch late in the morning and bring it down at lunchtime, and remember the jars of jelly, all the kids used to sit round

2.2.1: But with the madeira cake, ** used to always screw it up

2.2.2: **!

2.2.1: ** did!

2.2.2: It was you

2.2.1: No it wasn't

2.2.2: It was her, she will never give up she is very stubborn

2.2.1: She used to love getting this lovely sponge cake and she would go like that

2.2.2: No I didn't

2.2.1: And into a ball

2.2.2: I did not

2.2.1: You used to get hold of it and you used to squeeze it and then you used to look at me like that (gesture)

I: Is this something that happened a lot or is there one time you are thinking of a particular instance?

2.2.1: Not really, mainly just ** always screwing up her cake

2.2.2: I did not, it was **

2.2.1: Well, we'll never resolve that one coz mum doesn't remember

**Twins 2.5 – 16 year old dizygotic female twins**

**Cue-word – Trouble**

2.5.1: Trouble, hmm, she was the really naughty one between the two of us...

2.5.2: I so was not

2.5.1: Yeah you were and I remember I used to always get into

2.5.2: Don't even say that...you know that it is not true, it was always me getting into trouble for things you did

2.5.1: We always argue about this – there are so many times that I got into trouble for her mistakes

2.5.2: Whatever

I: Can you think of any examples

2.5.1: Hmmm, I don't think I can I just know it was always me who got caught and she was the naughtier of the two of us

2.5.1: I don't think so but we'll leave that to argue over later

**Twins 2.6 – 20 year old dizytotic female twins**

**Cue-word – Accident**

2.6.1: Uhm, I remember the worst accident I ever had was when we were about eight – we were playing and I got this nail in my foot

2.6.2: **, I don't think that was you you know, I remember that happening to me

2.6.1: What, in the park that time with *?

2.6.2: Yeah, it was me, I so remember the nail going right into my foot and seeing the blood come out of the hole it left

2.6.1: I remember seeing the hole too but it was on my foot not yours and I don't think I cried, I was too shocked but I cried when I had to get a tetanus shot

2.6.2: Yeah, I remember going to the doctor's for that too

2.6.1: So you think it was you?

2.6.2: Yeah, of course

2.6.1: Sorry about this, we sometimes argue over things that have happened in the past…

2.6.2: Yeah we do but I am pretty sure this time I am right you know, I remember it really well

**Continuation of Cue-word – Accident**

2.6.2: Yeah, like the mustard jar

I: What do you mean

2.6.1: When were about eight, again, we dared each other to each a jar of mustard

2.6.2: Yeah, and I wouldn't do it but she did and she was sick all over the kitchen

2.6.1: Someone was definitely sick but it wasn't me it was her.

2.6.2: We always argue over that one and it will never be resolved coz mum can't remember

2.6.1: Probably because we didn't want to get in trouble so we tried to hide it from her but she found out, like mums do

**Cue-word – Birthday**

2.6.2: Remember the birthday we had when that little kid with the playdough doll

2.6.1: Yeah,

2.6.2: And she put a paintbrush with glue on it behind my ear and I cried

2.6.1: No no no, sorry that was definitely me, I so remember feeling the glue behind my ear

2.6.2: Well so do I, and what about getting that bit of hair cut off

2.6.1: Yeah, that was awful I remember really crying and being so mad

2.6.2: I can't believe you think that that happened to you. I am sure mum will remember

2.6.1: Maybe, but I really do think it happened to me but I don't mind sharing

**Twins 2.8 - 16 yr old dizygotic female twins**

**Cue-word: Best Friend:**

2.8.1: When we were thirteen we went on holiday to Akaroa with the family and us kids were hanging around

2.8.2: Yeah and we saw these three girls

2.8.1: And Caroline and I saw them and we wanted to make friends with them so

2.8.2: Hey that was me and Caroline

2.8.1: No it was me and Caroline

2.8.2: No it was me and Caroline

2.8.1: She always says that she was the one that went over but I remember being really shy and going over anyway and now they are really good friends of ours

2.8.2: Well I say it was me who went over – and then you came over with everyone else after I had done all the hard work

2.8.1: No, you came over after we had been talking to them for a while coz you were too shy to go first

2.8.2: Well I don't agree but I am not about to argue about this now, she is our best friend now though

**Twins 2.9 – Nineteen year old Monozygotic male twins**

**Cue-word - Sport**

2.9.1 We have a big argument that a rugby coach calls us, he calls us one name right and the other one wrong and I'm sure he calls **' name wrong and ** is sure that he calls me wrong.

2.9.2 This has been a bit of an ongoing thing, since we were 10 years

2.9.1 We both won't back down about it, like I'm sure I'm right

2.9.2 And I'm sure I'm right

2.9.1 I think it is coz sometimes we uhm, we want to call umm, the other one the name and we were like, no no he was calling you that, like no no no he was calling you that....

2.9.2: We'll never resolve this

**Twins 2.10 – 17 year old monozygotic female twins**

**Cue-word – Pet**

2.10.1 We have this dog and I remember that video and one of us is uhmm

2.10.2 We were arguing about who it was the other day

2.10.1 Ah yeah, there is this video and dad goes, I am so sure it was you,

2.10.2 Serious??

2.10.1 Coz, uhm, ** liked to grab the boy dogs' balls

2.10.2 It certainly wasn't me

2.10.1 It so was you

2.10.2 You did it – I know you did

2.10.1 No I never did – It definitely wasn't me

2.10.2 Well we were only five so that was sort of, makes a difference

2.10.1 Or younger

2.10.2 Yeah, and we'd play with the dogs

2.10.1 And I just remember dad going ** don't do that

2.10.2 I am so sure it was you

2.10.1 I don't remember doing it, I was just watching the video and going which one of us is that.

2.10.2 Yeah, coz when we were little like we don't even know

I: So there is a video of it and you still can't tell who it is

2.10.1 Mum and dad probably do but I know it was her

2.10.2 Well I don't remember it and I think it was her

2.10.1 (sarcastically) "I have no recollection of it"

**Twins 2.11 – 17 year old monozygotic female twins**

**Cue-word - Car**

2.11.1 I remember once when we were travelling to um, up north and we were all crammed in the car – all the stuff was in the back and we were squashed and we had so many arguments the whole way, it was hot

2.11.2 It was an ugly car

2.11.1 Yeah, I just remember, you know, I always remember this stupid woman overtaking us and smacked right up against us

2.11.2 I remember when we were going to Akaroa every year, mum and I were going in the mini, and we had to get the cats, coz we were taking the cats back to Akaroa and we couldn't find them and we looked for like an hour for one of the cats and the other one we stuck in the car, by the time we got in the car the others were just about in Akaroa and we got in the....

2.11.1 I used to hate the windy hills on the way to Akaroa and I remember once I fell asleep and they were eating chocolate and chips and I missed out I always used to fall asleep - I used to try and sing songs just while we were travelling

2.11.2 Remember singing that song "I'm feeling kind of seasick"

2.11.1 Yeah, and next thing you know, who was spewing

2.11.2 Who?

2.11.1 You!

2.11.2 I was not spewing it was you

2.11.1 It wasn't me

2.11.2 It was ** (to interviewer)

2.11.1 I did not

2.11.2 She threw up after eating a bag of chips

I: So you don't think it was you

2.11.1 No, she threw up after I sang this song on the really curvy part of the road

2.11.2 It was so you

2.11.1 ** threw up all the time I never used to on the way to Akaroa –

2.11.2 You did that one time

2.11.1 I remember going up there and singing in your ear and you throwing up

2.11.2 NO no, it was definitely you

2.11.1 It was definitely **, it was **, it was definitely ** (to interviewer)

2.11.2 It was in the Honda and you were being so so ill

2.11.1 It was you **

2.11.2 She was singing "I'm feeling kind of seasick" to make me throw up and she ended up making herself sick

2.11.1 No, it was you

2.11.1 No it wasn't

2.11.2 Yeah well then again I've got a better memory than her…

2.11.1 Well we'll agree to disagree

**Cue-word – Being nervous**

2.11.2 I remember sitting the entrance test and I remember we had to go on the third one and I only knew one person and we were like, my friend Sophie and I were dressed the same.

2.11.1 Yeah, we dressed the same without even realising

2.11.2 No it wasn't you, it was me and Sophie dressed the same

2.11.1 She wore the mustard jersey, I was in the yellow jersey

2.11.2 In fact we have a photo in yellow jerseys

2.11.1 That was at Heaton

2.11.2 It was outside when were five and six

2.11.1 We were all wearing our yellow school bomber jackets that we had, we were all wearing those

2.11.2 Oh my God, ** and I dressed the same because we had like bobbed haircuts, yellow mustard jerseys, jeans and brown shoes, we dressed the same, we were in the same class and everyone was really confused and like my friend Danielle who I have known for ages, she came up to me and she goes, um are you ** or the other one, like she didn't' know, she was too scared to come and talk to us for hours, trying to work out who we were.

2.11.1: And I knew she couldn't tell the difference – because she had only met me once so we were really nervous about sitting those tests that day because we knew nobody

2.11.2 There was this one girl and she like had black leather pants and we looked like real dicks – remember her?

2.11.1 Well I remember the same thing but I remember being the one wearing the same clothes as Sophie

2.11.2 You are so wrong,

2.11.1 I am so not, you are just picking on me

2.11.2 **, you couldn't, Danielle couldn't have got confused between you and me, it had to be me and Sophie

2.11.1 You just don't want to admit, it was those bomber jackets

2.11.2 Oh my God you are so wrong, Sophie didn't wear the blue one

2.11.1 I wore the red one

2.11.2 You are always picking on me

**Twins 2.12 – 21 year old dizygotic twins**

Transcript of interview unavailable due to poor sound quality

**Twins 2.13 – 19 year old dizygotic female twins**

**Cue-word - Birthday**

2.13.1 I got this amazing treble clef hair clip for my birthday and she got something different, can't remember what but she really wanted my clip and kept saying it was her present.

2.13.2 It was my present, you got something totally different

2.13.1 Ok, so what did I get instead of the clip

2.13.2 I can't remember what you got but the clip was definitely mine

2.13.1 But I remember mum handing me the present and unwrapping it and seeing the clip there because I had asked for it

2.13.2 Well so do I so there you go. Anyway, it doesn't matter it isn't like we still have it but I still say it was mine

**Cue-word – Accident**

2.13.1 We always argue over this but I'll tell it, I remember when we were about ten and we were driving with mum, anyway, I was in the backseat of the car and for some reason I looked behind me and saw this car crash into the back of us.

2.13.2 Yeah, I know but I think it was me – I remember looking behind because we stopped suddenly at a set of lights and this car with a woman driving it just crashed right into us.

2.13.1 We were on our way to orchestra practice, remember?

2.13.2 Yeah, and I sat in the back

2.13.1 Well I know it was me, I remember seeing the woman's face right before she hit us, she was really upset

2.13.2 Yeah, I remember mum trying to calm her down

2.13.1 Well, I still think it was me but you can think what you like.

**Twins 2.14 – 16 year old twins monozygotic male twins**

**Cue-word – Fairground**

2.14.2 Remember when we went to the fair when we were on holiday in Australia?

2.14.1 Yeah, what about it

2.14.2 That roller coaster that we were both too scared to go on

2.14.1 Yeah, but were both weren't too scared because I got on it in the end and you chickened out

2.14.2 Wrong way mate, it was me who went on and you stayed on the ground with dad

2.14.1: No, sorry it was me who went up and you stayed with mum not dad.

2.14.2: I remember seeing you on the ground when we were going right to the top of the track

2.14.1 That doesn't mean anything, I remember it too

I: So you both didn't go on at different times

2.14.2 No, it was definitely only one of us and it was me.

2.14.1 I'm going to see if dad remembers that it was me

I: Do you think he'll be able to say who it was?

2.14.2 Probably not.

**Twins 2.16 –54 year old monozygotic female twins**

**Cue-word Accident**

2.16.1 I remember falling over and really hurting my elbow and knee when a wheel came off my roller skate

2.16.2 Hang on a minute, are you talking about those roller skates we got for our eighth or ninth birthday

2.16.1 Yeah, so what

2.16.2 Well that actually happened to me if you don't mind

2.16.1 What do you mean, it was me! I was skating with you and

2.16.2 Yeah, with Marie on the old tennis court

2.16.1 Yeah, but it was me not you, I remember it being really bumpy with grassy bits in it

2.16.2 I think you'll find if you think really hard it was me

2.16.1 Well I remember it so clearly, and you skated home to get mum

2.16.2 No, you skated home to get mum because I was hurt and crying and couldn't move

2.16.1 Oh well, I guess we get confused it happened so long ago

**Cue-word - Birthday**

2.16.1 Here we go, she is going to argue with me over this one too, but when we were about ten this girl in our class had a birthday party and only invited her and not me and I was really upset – this will be just like that skating thing we talked about a while ago

2.16.2 She is right, I am going to argue because it was me who stayed home and I remember lying under the table, being really resentful, waiting for you to get home

2.16.1 I remember mum and dad being really mad about only one of us being invited

2.16.2 Yeah, mum didn't want to let you go without me coz she knew I was upset.

2.16.1 More like she didn't want to let you go because I was upset!

2.16.2 But the thing that is funny about this party is that the who went to the party got her head dunked in water when they were bobbing for apples and came home with wet hair and mum was even madder because it was winter and really cold outside

2.16.1 Yeah, I remember her being mad but I say it was you

2.16.2 Ok, but I say it was you, again it was so long ago it really doesn't matter

2.16.1 No it does matter, it is annoying for you to say it was me when I know it was you because I wouldn't have gone to the party without you but you went without me and I was sad

2.16.2 Sorry but I still say it was you and I wouldn't have left you either

**Cue-word - Trouble**

2.16.2 There was one time when we both got into so much trouble, remember when were about eight years old and we were in that shop and we didn't have any money

2.16.1 Yes, and it was after school and we were so hungry but we wanted some sweets so she put a mixed bag in her satchel

2.16.2 What are you talking about it was you who took them, we were arguing over who was going to take them – we both wanted them – but you had the bag over your shoulder

2.16.1 No, you were holding the bag and put the lollies in it

2.16.2 Well, it doesn't matter who did it, we both got into trouble and got a good spanking when dad came home

2.16.1 The worst thing was having to wait until dad got home before being spanked too

2.16.2 Yeah, that was the worst part but it was definitely you.

**Twins 2.18 – 29 year old dizygotic female twins**

**Cue-word - Trouble**

2.18.2 At junior school I got into a fight in the playground and hit this boy, he started it but I hit him harder than he hit me

2.18.1 Yeah, we were both there but it was me who hit him back, he was teasing both of us for looking alike and we both got mad

2.18.2 Yeah, we both got mad but it was me who hit him, I remember going to the headmasters office to be told off

2.18.1 I don't remember that but I do remember hitting him and getting into some kind of trouble – I didn't think it was the headmaster, I thought it was our head of year who stopped the fight and made one of us go back into the school before dinner hour was over

**Twins 2.19 – 56 year old monozygotic male twins**

Transcripts of their two disputed memories are unavailable due to faulty tape recording

**3.6 Transcripts of non-disputed memories matched on Cue-Word.**

**Twins 2.4 – 19 year old monozygotic female twins**

**Cue-word – Being nervous**

2.4.2 W were like the new girls and you made me go up to Joanne and ask her if we could play with her at playtime, you made me because you were too scared you wuss

2.4.1 Yeah, I can't remember that but I am better friends with her than you now.

**Cue-word - 1st Day at school**

2.4.1 Sixth-form, we were in the same English class and throughout the whole year, tests, exams, assignments, essays whatever, there was always one mark difference or one or two per cent different, she always had the slightly higher mark than me, she was into media skills so she had better English than me, anyway, and so she always did that slight bit better than me, and it wasn't like I was annoyed about it, but like, twin rivalry, like that's not fair, I wish I could do better than you and then one time I got what? One more mark than her

2.4.2 Yes I remember

2.4.1 And I was so stoked and the teacher was like so happy for me, coz she was like following the rivalry the whole year and she was such a cool teacher, and she was great.

**Cue-word – Clothing**

2.4.1 Remember when Hannah told us we should change clothes to play a trick on the teachers and we wore school uniforms at the time?

2.4.2 Yeah, I remember.

**Twins 2.7 – 16 year old dizygotic female twins**

**Cue-word - Birthday**

2.7.1 We went to Corsair Bay for our birthday, on the way to Lyttleton, every year me and my friends go there but this year my family and ** came as well, and mum made this delicious pizza, chicken, cranberry and brie, yumm, we had such a good time.

2.7.2 Yeah I remember that, I also remember going out for lunch once when it was raining, do you remember?

2.7.1 Yeah, it was hosing down that day

**Cue-word - Restaurant**

2.7.2 Remember when I got the job at McDonalds, Lydia said to me after I got it hat she hadn't thought that I would get it because I had no experience

2.7.1 Well she had no experience

2.7.2 Yeah, I had no work experience

2.7.1 I didn't realise how easy it was to get a job at McDonalds

2.7.2 Coz I said to you in the car, coz working at McDonalds gave me a lot more self-confidence and I needed that, and so I wasn't very self-confident so she was really surprised that I got it, coz she had heaps of work of experience…

**Twins 2.15 – 23 year old monozygotic female twins**

**Cue-word – Best friend**

2.15.1 I remember when you told me that you and Michael were going out

2.15.2 Ohhh no

2.15.1 She stole her boyfriend, well ex-boyfriend off my friend, and my friend, well she didn't tell me the wee snob and my friend rang me up and said, oh Michael dumped me and I'm like, Oh I'm sorry, and then she said "guess who for" and I'm like, who, and she goes, your sister… I was really good friends with her so I said to *** isn't there something you need to tell me and she instantly knew what I was going on about, that was so funny….we were like good friends and she was an exchange student..

2.15.2 Well he broke up with to go out with the other girl again

2.15.1 Wanker

2.15.2 Yeah, oh well he is really strange and he smells and he chain smokes and he got his eyebrow pierced so I'm better off without him

**Cue-word - 1st Day School**

2.15.1 The beginning of 7th form, this exchange student from Germany and we were like really nervous because we had become her exchange partner towards the last minute coz her other one had bailed out, she came to our house. We just didn't

know what to expect, we had been writing to each other for a few months and we got along well in the letters but meeting is a completely different thing, we were really nervous

2.15.2 Yeah, because we were stuck with her whether we liked her or not.

2.15.1 It turned out really good and she was like really chatty the whole drive home from the airport and she spent the whole afternoon showing me photos and telling me stories about home and stuff, which was, she must have been feeling homesick or something. We both went to the airport and we only had a photo, because the actual exchange is a New Zealander goes over to Germany for two months and then come home for a few weeks and then the German comes over here for two months but since we only got in at the last minute Miriam missed out on going over there so everyone else who was at the airport to meet these people already knew them and we were the only ones who were like, uhh, but she spotted us straight away you know, coz like, twins... anyway, we were both good friends but she did have my bedroom

2.15.2 Well it is a bathroom now.

**Twins 2.17 19 year old dizygotic female twins**

**Cue-word - Clothing**

2.17.2 Remember when we were little and we wearing these, we got sent to our bedroom, and we didn't want to wear these sweatshirts

2.17.1 They were very ugly sweatshirts

2.17.2 We didn't want to wear them and they were really gross and mum made us wear them so she says to Miriam, coz we were making such a hoo haa over it and we didn't' like it and so we dribbled all the way down the sweatshirts so we wouldn't have to wear them out

2.17.1 Yeah, we did it on purpose but then we got sent to our bedroom...

**Cue-word - Being in Trouble**

2.17.1 We got sent to our bedroom, coz we got little kids sets of, to wash the dishes, and we had made a big splashing mess

2.17.2 I remember that

2.17.1 And we made a huge mess and we got sent to our bedroom coz we had made a big mess and we weren't happy about being sent to our bedroom either so we got our strawberry shortcake talcum powder and made our bedroom snow...the whole room was white and mum was not impressed!

2.17.2 I so remember that

### 3.7 Analysis of Transcripts

It is clear from the transcripts of the disputed memories that some of the disputes the twins had over their memories were quite lively. It is important to note that the participants were not aware that the research was being conducted on disputed memories. Twins 2.6, for instance, apologised for arguing in front of the interviewer, one saying "sorry about this, we sometimes argue over things from our past" and Twins 2.1 remarked that they would be having many arguments after the interview over some of their new disputes that emerged during the meeting. Other twins, upon discovering a memory was in dispute, refused to argue about the incident in front of the interviewer and said they would discuss it later. Twins 2.5, for example, disagreed as to which one of them made the first approach to a girl who is now their best friend and one of them commented: "Well I don't agree but I am not about to argue about this now".

Twins 2.1 disputed the most memories during the cue-word experiment with fourteen in total. It is interesting to note during their discussions, after almost every disputed memory, they went on to question each other about other, related memories to ensure those events could be correctly assigned to the rightful owner of the memory. For example after disputing who was injured when a nail went through their shoe Twin 2.1.1 said "and how about when that cat scratched you up" when Twin 2.1.2 agreed it happened to her Twin 2.1.1 replied "good, at least you remember that one right".

Two independent raters coded the disputed memories in an attempt to find out whether they differed in qualitatively different ways to non-disputed memories. A comparison of the 36 disputed memories was made to 36 non-disputed memories matched on cue-words. Table 3.5 shows some of the results and is divided by memory type and also whether the disputed memory was a new dispute or an old dispute. This distinction was made to capture the differences between the events already known to be in dispute and those that were discovered to be in dispute through the context of the experiment.

The measures used in the qualitative analysis were chosen because they appeared to best reflect the discourse between the participants. Firstly, the total number of words was counted for each memory type. This was done on the assumption that the amount of detail the participants provided for each memory type would be correlated with the number of words used to describe each event. The second category that was used in this analysis was the number of words associated with emotion. The third and fourth categories that were used were the use of personal and possessive pronouns. These were included to capture any differences between the ways in which the participants claimed ownership of the memory. The final category that was used was the use of the word "we". This distinction was made to examine how often the twins referred to themselves as a pair when discussing each event.

**Table 3.5 Analysis of transcripts for 36 disputed and 36 non-disputed memories matched on cue-word.**

| | Non-Disputed Memories | Memories disputed before experiment | Memories discovered to be in dispute during the experiment |
|---|---|---|---|
| Mean number of words used to describe memory | 54.1 | 94.90 | 146 |
| Mean number of words associated with emotion per | .76 | 1.74 | 1.97 |

| | | | |
|---|---|---|---|
| memory | | | |
| Mean number of personal pronouns per memory | .2 | .54 | 4 |
| Mean number of possessive pronouns per memory | 1.94 | 6.44 | 11.17 |
| Mean number of times "we" used per memory | 2.1 | 2.37 | 2.5 |

Notes: Two independent raters reached 84% agreement and differences were resolved by discussion.

Table 3.6 below shows the mean number of words associated with emotion, the use of possessive and personal pronouns and the use of the word "we" in relation to the total number of words used per memory type. The last column in the table shows the results of a series of analyses of variance that were conducted to examine what effect memory type had on the number of words used, words associated with emotion, use of personal and possessive pronouns and the number of times the twins referred to themselves as twins when discussing the memory.

**Table 3.6 Analysis of 36 disputed and non-disputed memories in relation to number of words used for each measure in relation to total number of words used.**

| | Non-Disputed Memories | Memories disputed before experiment | Memories discovered to be disputed during experiment | f value |
|---|---|---|---|---|
| Mean number of words used to describe memory | 54.1 | 94.90 | 146 | 18.24*** |
| Mean density of words associated with emotion | .76 / 54.1 | 1.74 / 94.90 | 1.97 / 146 | 8*** |
| Mean density of personal | .2 / 54.1 | .54 / 94.90 | 4 / 146 | 3.01 |

| | | | | |
|---|---|---|---|---|
| pronouns per memory type | | | | |
| Mean density of possessive pronouns per memory type | 1.94 / 54.1 | 6.44 / 94.90 | 11.17 / 146 | 15*** |
| Mean density of times "we" used per memory type | 2.1 / 54.1 | 2.37 / 94.90 | 2.5 / 146 | .01 |

Notes: Results of a two-tailed test (df = 68) are shown * $p < .05$; ** $p < .01$; *** $p < .001$.

The main conclusions that can be drawn from the above analyses are, firstly, the participants used more words in discussing disputed memories than they did non-disputed memories. Secondly, the memories that were discovered to be in dispute during the study elicited a greater number of words than memories that were known to be in dispute prior to the study. Clearly a new dispute would engender more discussion between the twins thus it is difficult to say what this result means apart from to show the lively discussion that can result once a disputed memory is discovered. This trend was followed with the number of words associated with emotion, the use of personal pronouns. The most interesting results comes from the difference between memory types in the use of possessive pronouns, for example *me* or *mine* and *we.* There was very little difference in the way the twins referred to themselves as a pair across all three memory types i.e.; "we". There were, however, significant differences between memory type and possessive pronouns. This would seem to suggest two things. First, despite any disagreement as to who an event legitimately belonged, the twins still referred to themselves as a pairs suggesting that the disputes do not alienate the twins from one another. Second, despite the fact that the twins knew the memory was in dispute and, one of them must be incorrect in their claim, both individuals within each twin pair were motivated to claim the memory as their own. This is evident by the average number of possessive pronouns in each memory type increasing from 1.94 for non-disputed memories, 6.44 for known disputed memories and 11.17 for new disputed memories.

### 3.8 Discussion

The main effect the shift in methodology had was the findings on gender differences. As noted earlier, Study 1 found significant differences in the number of disputed memories male and females reported. In Study 2, however, there were no differences between the number of disputed memories reported by males and females. This difference can be in part be explained by looking at the change in methodology and the qualitative data which emerged from the two studies. In the cue-word study 75% of the male twins' disputed memories were *new* disputes i.e., they were not aware the memory was in dispute prior to the study, whereas only 56% of the female twins' disputed memories were discovered to be in dispute during the cue-word study. Given that three quarters of the male twins' disputed memories were only discovered in the context of the cue-word study it is hardly surprising that only one in nine males reported disputed memories in Study 1, so that when they were asked directly whether they had experienced disputed memories with their twin they were unaware that they had.

The goal of Study 2 was to examine whether disputed memories could be elicited using the cue-word technique without specifically prompting them. In this regard Study 2 was successful in demonstrating that disputed memories could be elicited without the presence of demand characteristics. Indeed it may be possible that the participants in this study had even more disputed memories but, as noted earlier, were unwilling to argue in front of the interviewer. Further, only forty cue-words were used and thus only a small proportion of the participants' memories were tapped suggesting that they may have had many more disputed memories than those accessed during the actual study. The number of disputed memories that were uncovered during the course of the cue-word study supports the earlier claim that disputed memories amongst twins are a relatively common occurrence. Indeed the 20 sets of twins in this cue-word experiment produced 3 more disputed memories than the 20 sets of twins in Study 1 even though they were specifically *asked* for them and, in some cases, were given up to a week to try and recall them before our meeting. This result supports the supposition that disputed memories are difficult to simply recall and suggests that the cue word technique is a very useful tool in eliciting these types of memories.

# CHAPTER 4

## Study 3

## Disputed memories in non-twins

### 4.1 Introduction

Studies 1 and 2 confirm that twins do indeed experience disputed memories and suggest that they are a relatively common occurrence whose recall is not easily cued. The next logical step was to ask whether other members of the population, for example close siblings or friends, would also report having experienced disputed memories. Study 3 therefore asked non-twins whether had they ever experienced disputed memories.

### 4.2 Method

A questionnaire was distributed to 69 second-year psychology students during class-time. The participants had a median age of 21 (range 18-46) and 46 of them were females. Participants were given a questionnaire that asked whether they had ever experienced a disputed memory. The questionnaire began:

**Figure 4.1 Questionnaire on frequency of disputed Memories in Non-Twins**

"I am carrying out a study of disputed memories and am currently gathering data on the issue. A disputed memory is a memory in which two people agree on most of the details of what happened but disagree on to whom the event occurred. One such example of this occurred when two girls argued over which of them got sent home from school for wearing too short a skirt. They agreed on most of the details of the incident and agreed that only one of them was sent home but both believe they were the person who was actually sent home. Everyone makes mistakes in their memories, the kind of memory that we are looking for is when you get the memory mostly right except that the event never happened to you but did happen to someone else.

"This questionnaire asks whether you have ever experienced this type of memory before. Would you please take a few minutes to consider the following questions and respond appropriately".

"Have you ever had a disputed memory? Yes ____, No ____. If no, please skip to the background questions on the next page. If yes, please continue with the rest of the questions on this page before going to the background questions".

"How many different, specific incidences of disputed memories could you clearly recall and describe now? If you have more than one disputed memory, please pick your clearest case of a disputed memory that happened to you and answer the following questions about it".

"Please begin by giving a brief description of one of the disputed memory. How old were you at the time the incident(s) occurred. How old was the other person when the incident(s) occurred. What is your relationship to the person you disagree with (e.g. friend sibling)? What is the gender of the person you disagree with? Are you male or female? How old are you? Do you have any siblings? For each sibling please indicate their ages".

**4.2 Results**

Of the 69 participants who completed the questionnaire, 6 reported having experienced a disputed memory. Two disputed a memory with a same-sex sibling close in age, one disputed a memory with a different-sex friend close in age, and three disputed memories with same-sex friends. The median age of the participants at the time the disputed event occurred was 10.5 years (range 6-18). Table 4.2 below shows the distribution of the disputed memories amongst the participants. It was assumed that all of the participants had friends thus the number of disputed memoires between friends and siblings were counted as well as whether they were the same or different gender. In order to compare these participants to twins, they were also sorted by whether they had a sibling two years or less apart from them in age. No participants with siblings more than two years apart reported a disputed memory. Three participants indicated that they thought they had experienced at least one disputed memory but could not recall any

details surrounding the event, nor could they recall who the dispute was with, their disputed memories were therefore not included as data for this study.

**Table 4.2 Distribution of disputed memories reported in 69 non-twins**

| Type of person with whom the memory is disputed | Number of Ss with siblings and friends | Number of disputed memories reported | % of Ss with disputed memories |
|---|---|---|---|
| Sibling < 2 years same sex | 22 (15 f) | 2 | 9% |
| Sibling < 2 years different sex | 16 (10 f) | 1 | 6% |
| Sibling > 2 years same sex | 9(5f) | 0 | 0% |
| Sibling > 2 years different sex | 14 (8 f) | 0 | 0% |
| Friends same sex | 69 (46 f) | 3 | 4% |
| Friends different sex | 69 (46 f) | 0 | 0% |

Note: Number of female participants is noted in parentheses.

Due to the fact that participants in this study were given the same definition and description of a disputed memory as the twins in Study 1 (section 2.2), a direct comparison of the results can be made. A test of proportion between the percentage of twins reporting disputed memories in Study 1 (65%) and the percentage of participants with close siblings reporting disputed memories in Study 3 (8%) showed a significant difference at the $p < .001$ level.

Brief descriptions of the 6 disputed memories found in Study 3 are shown in table 4.3 below

**Table 4.3 – Verbatim descriptions of disputed memories reported by participants**

| Age & Gender of Ss | Relationship with disputee | Ages of Ss and disputee | Description of incident |
|---|---|---|---|
| Female 21 | Sister | I was six She was Four | One Christmas a doll was given to one of my sisters and I. The other got a teddy. Both of us think we were given the doll |
| Female 18 | Sister | I was 7 she was 6 | Me and my sister both remember having a really bad illness – mild scarlet fever – only one of us really did, the other was at home with a cold |
| Female 20 | Female friend | We were both 17 | I'm sure that my sister dropped her drink in McDonalds but she is convinced that I dropped her drink it was so embarrassing |
| Female 19 | Female friend | We were both 18 | I was in a nightclub with a friend and we were arguing about who was to pay for drinks and he got us kicked out – he says it was me who got us kicked out |
| Female 20 | Female friend | We were both 14 | Me and my friend were sunbathing and one of us got stung by a bee on the stomach – I'm pretty sure it was me but she thinks it was her |
| Female 26 | Female friend | We were both 7 | An airforce plane flew very low over our house when we were out on the lawn. I was on my bike and fell off because of fright. My friend who was running behind laughed at me. She claims it was the other way around |

## 4.4 Discussion

Study 3 was conducted to test whether non-twins would report having experienced disputed memories. The results indicate that they do but at a much lower rate than twins.

One of the most striking aspects of the participants' disputed memories described above is the similarity to the disputed memories described by participants Studies 1 and 2. Indeed four of the six disputed memories reported in this study are almost identical to disputed memories reported by twins in the two previous studies. A participant above, for example, described a dispute with her sister over who was ill with Scarlet Fever. This dispute is very similar to a disputed memory of Twins 1.15 who could not agree over who had stayed home from school for a week suffering from Chicken Pox. Similarly the dispute with a friend, described above, over who fell off a bicycle when they were together is the same type of dispute as Twins 2.1 who disagreed as to which of them fell off their bicycle and badly hurt her knee. A dispute in this study between friends over who had spilt a drink at McDonalds is comparable to the dispute of a set of twins in Study 4 (reported next in Chapter 5) over who had spilt a large glass of coke on a brand new cream carpet in their home. Oddly, both "spilling" disputes occurred three years previously. Lastly, the disputed memory between friends in this study over who had been stung by a bee was the same type of disagreement as Twins 2.1 who also disputed who had been stung by wasps when they were much younger.

This similarity of the participants' disputed memories lends support to the idea that everyone is susceptible to experiencing disputed memories. Further, and rather unsurprisingly, the participants in this study experienced a disputed memory with someone who was within two years of their own age, indicating that two factors appear to contribute to the phenomenon of disputed memories. First, the amount of time spent together and second, the similarity between the people involved in the dispute. When viewed in this light it is not surprising that twins dispute memories more often than non-twins given the richness of their shared history. A further similarity between the disputes reported in this study and the previous studies is that disputes tended to be over memories

derived mostly from childhood and less often from adulthood. Lastly, the fact that three people reported that they had experienced a disputed memory but could not recall any of the details surrounding the dispute lends further support for the assertion that disputed memories are difficult to recall by simply asking about them.

# CHAPTER 5

Study 4

## How twins claim their recollective memories

### 5.1 Introduction

The results from Studies 1 and 3 confirmed that disputed memories can be elicited by asking people about them. Study 2 demonstrated that disputed memories could be elicited in a naturalistic way using the cue-word technique. Study 4 was conducted to examine how twins claim their personal memories and to see whether disputed memories could be uncovered using yet another methodology.

One method of questioning people about events from their childhood is to ask them about events based on information obtained from their parents or close acquaintances. This method has been used extensively in research on the creation of false memories (Hyman & Billings, 1998; Hyman, Husband & Billings, 1995; Loftus & Pickrell, 1995) and involves presenting participants with three true events from their childhood provided by their parents, along with a foil item that is also presented as if it had been provided by their parents.

No foil items per se were used in the current study as the participants' twins' events could be considered to be foil items. The rationale for this study was that if disputed memories are indeed a common occurrence amongst twins then ownership of the ten events provided by the parents may be disputed between the twins.

### 5.2 Method

Ten people responded to advertisements in the local media asking for twins to take part in a study of memory. Three sets had previously taken part in Study 1 and were not included as they were aware of the nature of the research. One additional set of twins did not complete the study. Six sets of twin s therefore took part in Experiment 4. Three were dizygotic female twins, two were monozygotic female twins and one set were

monozygotic male twins. Participants had a mean age of 24 (range 16-32) and knew only that the author was conducting research on personal memories. Once permission was obtained letters were sent to the participants' parents asking them to provide events from the lives of their twins in response to ten cue words. The ten cue words were chosen on the basis that they had elicited disputed memories in Study 2 and they were everyday words that the parents might have found easy to come up with events for. Included with the letter were a stamped-addressed envelope and a lottery ticket for the parents as a token of appreciation for their help with the study.

**Figure 5.1. Letter Sent to Parents inviting their participation in the study**

"Dear (name of parent)

I am conducting an experiment on memory in twins and need information from you about events from their childhood. I am researching how well twins are able to correctly recall events from their past and how they distinguish their own memories from their twin's so it is very important that they do not see what you write on the enclosed form. I will be asking you to provide 5 childhood memories for each twin (10 in total) and the memories can be from any age between 5 and 13 years old.

Enclosed is a form which contains 10 everyday words – could you please think about each word, one at a time, and try to think about an event which occurred to one of your twins **INDIVIDUALLY.** As I am researching how well they can distinguish their memories it is important that the event only happened to one of them (although both of them might have present – eg both of them running down the road and one of them spraining their ankle). The memory doesn't have to involve the word directly, they are simply there to help you think of memories for your children (it is sometimes harder than it seems!) if you can't think of a memory for the given word please feel free to write down a different event/memory and cross out the cue word. So to sum up, there are ten words please provide five memories for each twin – it doesn't matter which words are for which twin, as long as there are five memories at the end for each of them and that you have indicated which memory is for which twin. Once you have finished could you

please send back the completed forms in the stamped addressed envelope provided at your earliest convenience.
The twins will be paid for their participation in this study".

The cue words parents were given were: Accident, Birthday, Being in Trouble, Church, Picnic, Car, Christmas, Holiday, Pet, School.

When the completed forms were returned by the parents appointments with the participants were made. No data was collected as to which parent completed the questionnaire. At the first meeting, which took place in the twins' homes, the participants were told that the author had a list of ten events from their lives and that they would be asked to answer a questionnaire about each event. The questionnaire was a version of the Rubin et al. (2001) questionnaire used in Study 1 that was shortened for Experiment 4 for two reasons. First, the twins in Study 1 reported the questionnaire to be somewhat tedious to complete. Second, the twins in Study 1 took up to two hours to complete ten questionnaires and it was felt that a shortened version would prevent participants from being careless or acquiescent in their responses. The revised questionnaire is reproduced in Figure 5.3 below.

**Figure 5.2 Shortened version of Rubin et al. Questionnaire**

1. As I remember the event, I feel as though I am **reliving** the original event.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

2. As I remember the event, I can **hear** it in my mind.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

3. As I remember the event, I can **see** it in my mind.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

4. As I remember the event, I can recall the **setting** where it occurred.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as clearly as if it was happening right now |

5. Sometimes people know something happened to them without being able to actually remember it. As I think about the event, I can actually **remember** it rather than just knowing that it happened.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as much as any memory |

6. As I remember the event, I comes to me in words or in pictures **as a coherent story** or episode and not as an isolated fact, observation or scene.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as much as any memory |

7. Since it happened, I have **thought or talked** about this event.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | vaguely | | distinctly | | as often as any event in my life |

8. As I remember the event, I imagine it again through **my own eyes** seeing what I would have seen then, or as an **observer** from a different perspective that the one I had.

| 1 | 2 | 3 |
|---|---|---|
| own eyes | observer | can't tell |

9. How old were you when the event happened _____ yrs old

10. I believe this event happened to:

| 1 | 2 | 3 |
|---|---|---|
| Me | My Twin | Not sure |

The participants were each given an individual questionnaire for each of the ten events provided by their parents. The ten events were then read aloud exactly as they had been written by the parents, but with all references as to who the event had happened to removed. The participants were asked to write down a short description of the event at the top of each questionnaire and then to answer each question. Events were presented one at a time and in random order. Once this process was complete the questionnaires were collected and arrangements were made to meet again a week later. The participants were asked not to discuss the experiment with each other and particularly not to discuss the events they had been asked about. After a delay of one week the twins were again met in their homes. Once again the ten events were read aloud in the same order as they were originally presented and the participants were asked to complete a questionnaire for each event. After all ten questionnaires had been collected each event description was again read aloud and the participants were asked to state whom they believed the event happened to.

**5.3 Results**

In examining the completed questionnaires after the initial meetings with the participants, twelve of the sixty events the twins rated appeared to be in dispute. In one case both twins claimed the memory as their own, in another both claimed it was their twin's "memory" and in the ten other cases both agreed who the event happened but this contradicted the information provided by the parents. Careful note was taken of these twelve memories and after participants re-rated the ten events a week later the questionnaires were checked for any disputed memories. The same twelve events appeared to be in dispute on re-test, however, from the ensuing discussion it seemed clear that only two events were genuinely in dispute. The other ten events appear to have been attributed to the wrong twin by the parent who completed the form. For example, when those ten events were read aloud the participants concerned immediately agreed about who the event happened to and claimed that their parent had been mistaken.

The first of the two genuine cases of disputed memories concerned an incident in which two 19 year old male monozygotic twins believed the other to be the one who

placed Monopoly money in a collection plate during a minister's talk at Church when they were approximately five years old. The parent identified Twin 4.4.2 as the protagonist in the event. The ratings of the disputed memory are shown in 5.4 below.

**Table 5.3 – 1st and 2nd ratings of Twin Set 4.4's disputed memory**

| Rater | Relive | Hear | See | Set-ting | Recall | Story | Thought | POV | Who |
|---|---|---|---|---|---|---|---|---|---|
| Twin 4.4.1 – 1st rating | 1 | 1 | 3 | 3 | 1 | 1 | 1 | Obs | Twin |
| Twin 4.4.1 - 2nd rating | 5 | 1 | 3 | 4 | 1 | 1 | 1 | Obs | Twin |
| Twin 4.4.2 – 1st rating | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Field | Twin |
| Twin 4.4.2 - 2nd rating | 5 | 1 | 1 | 1 | 1 | 1 | 1 | Field | Twin |

In examining the twins' ratings of the disputed memory there is very little difference between the way in which they rated the memory. The only difference is that Twin 4.4.2, the protagonist identified by the parents in the event, recalled the event from the field perspective and Twin 4.4.1, who claimed his twin placed the Monopoly money in the collection plate, recalled the event from the observer perspective.

Twins 4.5 are twenty-one year old monozygotic female twins disputed the second event which was over who spilt a can of cola on a new cream carpet three years previously. Both believed their twin to be the one who spilt the drink although the information provided by the parent(s) suggested that it was Twin 4.5.1. The ratings for this disputed memory are shown in table 5.5 below.

**Table 5.4 – 1st and 2nd Ratings of Twin Set 4.5's Disputed Memory**

| Rater | Relive | Hear | See | Set-ting | Recall | Story | Thought | POV | Whose event |
|---|---|---|---|---|---|---|---|---|---|
| Twin 4.5.1 – 1st rating | 1 | 1 | 3 | 5 | 3 | 2 | 1 | Obs | Twin |
| Twin 4.5.1 – 2nd rating | 3 | 3 | 2 | 2 | 1 | 2 | 1 | Obs | Twin |
| Twin 4.5.2 – 1st rating | 3 | 6 | 3 | 7 | 4 | 2 | 1 | Obs | Twin |
| Twin 4.5.2 – 2nd rating | 4 | 4 | 4 | 6 | 5 | 4 | 2 | Obs | Twin |

Although both twins were present when the event occurred it seems apparent from the ratings that the twin who the parent identified as having actually spilt the coke, Twin 4.5.2, has a more vivid recollection of the event. This is particularly evident on the setting scale which is used to measure how well people recall the setting of an event. Indeed if one were using phenomenal characteristics as proof of who the memory actually belonged to it would seem that Twin 4.5.2 was indeed the one who spilt the coke as she consistently rated the event higher than Twin 4.5.1. Note that both twins recalled the event from the observer point of view.

One theory that was made at the beginning of this study was that the participants would rate the memories of their own events higher than they would rate memories for events that happened to their twin. For example, the parents of Twins 4.5 provided the following description to the cue word accident: "They were both playing rugby in a league final when ** got tacked and broke her nose". It was expected that the participant who actually did break her nose would rate the memory higher on the scales used to measure recollection. This, however, was not the case and whilst both twins agreed whom the event happened to, the participant who witnessed the event rated the event

higher on all of the scales. Table 5.6 below shows that, overall, there was very little difference between the way the participants rated their own and their twins' events.

**Table 5.5 Mean ratings of own events and twins' events**

| Rater | Relive | Hear | See | Setting | Remember | Story | Thought |
|---|---|---|---|---|---|---|---|
| Mean Rating of Own Events | 3.6 | 3.1 | 4 | 4.3 | 3.9 | 3.3 | 3.5 |
| Mean Rating of Twin's Events | 3.8 | 3 | 3.9 | 4.4 | 3.4 | 3.2 | 3.6 |
| Difference in mean rating own and twin's events | .2 | .1 | .1 | .1 | .5 | .1 | .1 |

In examining the participants' ratings of their own and their twins' events it is clear that there is very little difference between the way they rated the events provided by their parents and t-tests conducted on the ratings show no significant differences.

One of the more interesting results from this experiment were the participants' ratings on the point of view scale. From a survey of the literature it was expected that the participants would be more likely to recall their own events from the field perspective and their twins' events from the observer perspective. Once again, however, this was not case. Shown below are a series of tables which show each individual twin sets' ratings on the point of view scale of their own and their twins' events on the point of view scale. It is of note that none of the twins' ratings on the point of view scale changed between test and re-test.

**Table 5.6 Twin set 4.1 percentage ratings of own and twin's events on point of view**

| | Twin 4.1.1 own memories | Twin 4.1.1 ratings of twin's memories | Twin 4.1.2 own memories | Twin 4.1.2 ratings of twin's memories |
|---|---|---|---|---|
| Field | 40 | 60 | 60 | |
| Observer | 20 | 20 | 40 | 100 |
| Unsure | 40 | 20 | | |

**Table 5.7 Twin set 4.2 percentage ratings of own and twin's events on point of view**

| | Twin 4.2.1 own memories | Twin 4.2.1 ratings of twin's memories | Twin 4.2.2 own memories | Twin 4.2.2 ratings of twin's memories |
|---|---|---|---|---|
| Field | 10 | 60 | 20 | 10 |
| Observer | 90 | 40 | 60 | 40 |
| Unsure | | | 20 | 50 |

**Table 5.8 Twin set 4.3 percentage ratings of own and twin's events on point of view**

| | Twin 4.3.1 own memories | Twin 4.3.1 ratings of twin's memories | Twin 4.3.2 own memories | Twin 4.3.2 ratings of twin's memories |
|---|---|---|---|---|
| Field | 30 | 40 | 100 | 30 |
| Observer | 40 | 40 | | 70 |
| Unsure | 30 | 20 | | |

**Table 5.9 Twin set 4.4 percentage ratings of own and twin's events on point of view**

| | Twin 4.4.1 own memories | Twin 4.4.1 ratings of twin's memories | Twin 4.4.2 own memories | Twin 4.4.2 ratings of twin's memories |
|---|---|---|---|---|
| Field | 10 | 40 | 60 | 60 |
| Observer | 80 | 40 | 40 | 20 |
| Unsure | 10 | 20 | | 20 |

**Table 5.10 Twin set 4.5 percentage ratings of own and twin's memories on point of view**

| | Twin 4.5.1 own memories | Twin 4.5.1 ratings of twin's memories | Twin 4.5.2 own memories | Twin 4.5.2 ratings of twin's memories |
|---|---|---|---|---|
| Field | 60 | 20 | 80 | |
| Observer | 20 | 80 | 20 | 80 |
| Unsure | 20 | | | 20 |

**Table 5.11 Twin set 4.6 percentage ratings of own and twin's events on point of view**

| | Twin 4.6.1 own memories | Twin 4.6.1 ratings of twin's memories | Twin 4.6.2 own memories | Twin 4.6.2 ratings of twin's memories |
|---|---|---|---|---|
| Field | 10 | 60 | 20 | 60 |
| Observer | 80 | 40 | 60 | 20 |
| Unsure | 10 | 40 | 20 | 20 |

A close look at the tables show that who the event "belonged" to had little bearing on how the participants rated them on the point of view scale. Twins 4.1, for instance, were very different in the way they rated the events. Twin 4.1.1 recalled his brother's events from the field perspective more often than he rated his own from the field perspective, interestingly he also rated his brother's events higher on all of the scales used to measure recollection. Conversely, his brother recollected all of his brother's events from the observer perspective and the majority of his own events from the field perspective. Twin sets 4.4 and 4.6 both recalled the majority of their own events from the observer perspective and their twin's events from the field perspective.

For the ten events that were originally misattributed by the parents it was expected that the "true" protagonists in the event would emerge once the ratings were completed. This however was not the case as the twins rated these events almost identically to each other, just as they did for events where the protagonist had been

correctly identified by the parent. This can be explained by the fact that both twins were present when the event took place and therefore both have a memory for the event.

### 5.6 Discussion

The most likely explanation for the results on the point of view dimension is simply that both twins were present when all of the events took place. It therefore stands to reason that both twins have a memory for the event on which their ratings are based. Let us return to an example given above where one of a set of female twins broke her nose playing a game of rugby and apply it to the relevant literature. Both twins were playing the game when the accident occurred but the protagonist in the event, Twin 4.4.1 recalled it from the observer perspective and her twin, who witnessed the event, recalled the event from the field perspective. Nigro and Neisser (1983) are amongst the first modern psychologists to investigate the distinction between the recall from the field and observer point of view. They postulated that situations involving a degree of self-awareness or self-consciousness would be recalled from the observer perspective and emotionally charged events are recalled from the field perspective. One can easily imagine that breaking one's nose during an important match would indeed involve a certain amount of self-awareness so her recollection of this event from the observer perspective might be expected. One might also expect that the twin who witnessed the accident would recall it from the observer perspective, this once again was not the case, and on test and re-test the witness to the event reported that she recalled it from the field perspective. Nigro and Neisser's (1983) theory can again be used to explain this. One would expect that witnessing your sister's nose being broken during an already highly charged event (final match in league) would be an emotional event and may explain why she recalled it from the field perspective.

The relatively small sample size used in this study makes it difficult to draw any conclusions on the point of view perspective. As both twins were present when all of the events took place they have their own independent memories and are thus reporting from them. The fact that the participants recalled many of their twins' events from the field perspective is interesting but does not fit neatly into the existing literature. If, for example

Twin A recalls her twin's event from the field perspective she is not saying that she recalls the memory from the view of the person to whom the event actually *happened* but simply that she recalls the event, as a witness, from the field perspective.

Although the method of asking parents to provide details of events from their children's lives has been used extensively in other research on autobiographical memory it does not seem as promising a method in the case of twins. Of the sixty events obtained from parents of participants ten events appeared to have been attributed to the wrong twin which may have compromised the quality of the materials. In one case, for example, one twin ended up rating seven of her own memories whilst her twin had only three of her own memories to rate. Given that the letter to parent(s) specifically stated that they must be sure whom the event happened to for it to be included in the study, it is difficult to say how this problem could be overcome. One parent, for instance, attached a letter to the list of events describing how difficult she had found the exercise stating that she had always considered her twins to be "the twins' and never saw them as individuals!

Each set of participants evaluated only ten memories of events provided by their parents making it difficult to compare the frequency of disputed memories to the previous studies. Given the difficulty the parents had in supplying events for their twins it would be not be feasible to use this method for a larger number of events. One way this method could perhaps be improved, to ensure the parents correctly attribute an event to each twin, might be to interview the parent(s) in person, rather than send a questionnaire, and use prompts such as photographs or home videos to facilitate the correct identification of the protagonist.

Despite the fact that two disputed memories were elicited during this study the main contribution of Study 4 is in demonstrating that the use of parent-provided information is not a reliable methodology to use in the study of disputed memories in twins.

# CHAPTER 6

# Study 5

# Re-rating disputed and non-disputed after a two year interval

## 6.1 Introduction

The last experiment carried out for this dissertation examined what effect a two-year delay may have had on participants' original ratings of their disputed and non-disputed memories. The participants in Study 1 all reported disputing memories with their twin, and these memories were rated using the Rubin et al (2001) questionnaire. These ratings were then compared to ratings of shared, non-disputed memories. Experiment 1 found significant differences between disputed and non-disputed ratings on a number of scales often used to measure recollection, for instance, reliving, remembering, hearing, seeing, setting, spatial layout and the emotion of the event. In Study 5 some of the Study 1 participants re-rated their original memories.

A number of factors were thought to be of interest for this experiment. 1, would the *difference* in ratings between disputed and non-disputed memories be maintained after a two-year delay? 2, would the memories for the disputed events have a slower rate of decay than non-disputed memories? 3, would the original disputed memories be recalled as having been disputed by the participants? 4, would any of the originally non-disputed memories be subsequently disputed at retest?

## 6.2 Method

Attempts were made to contact all of those who took part in Study 1, but of the twenty sets of twins who originally took part only six *sets* of twins were able to take part in Study 5. All these participants were female with a median age of 28 (range 19-54) and three sets were monozygotic. Participants were told that they would be asked to re-rate their original ten memories from Study 1. Each participant was then sent ten copies of the

original Rubin et al. (2001) questionnaire used in Study 1 and the participants' original one-line description of the event was written at the top of each one. No distinction was made between the disputed and non-disputed memories on the questionnaires and the participants were not reminded that the original experiment had been on disputed memories. The only change that was made to the questionnaire was the addition of a final question which asked "I believe this event happened to me, I believe this event happened to my twin, I am not sure who this event happened to". This was included to allow a measure of what memories were disputed when the questionnaires were returned. Included with the ten questionnaires were a stamped-addressed envelope and a lottery ticket as a token of appreciation for their participation in the study.

### 6.3 Results

In the original experiment the current six sets of twins rated nine disputed memories and fifty-one non-disputed memories. During re-test only eight of those memories remained disputed. The ownership of one dispute had apparently been resolved since Study 1. Two sets of twins now reported two disputed memories and the rest each reported one. Table 6.1 below shows the participants' original ratings on the questionnaire items of both memory types and their new ratings on re-retest after a two-year time period.

Study 1 found significant differences between ratings for disputed and non-disputed memories were found on a number of scales. Analysis of the six sets of twins' original ratings from that study however found only one significant difference between ratings of disputed and non-disputed memories and this difference was on the emotion scale. This decline in the number of significant effects may be a reflection of the reduction in power. To some extent, this reduction in the number of significant effects may reflect the reduction in power, but analysis of the re-test ratings, shown in Table 6.1 below, found significant differences between disputed and non-disputed memories on ten scales: reliving, seeing, talking, emotion, setting, actually remember the event, in words, go back in time, significance of the event, remember and thought about the event.

**Table 6.1 Mean and standard deviations of ratings for disputed and non-disputed memory ratings on test and re-test**

| | Mean DM Ratings Test | (SD) | Mean NDM Ratings Test | (SD) | t-value | Mean DM Ratings Re-test | (SD) | Mean NDM Ratings Re-test | (SD) | t-value |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Recollection | | | | | |
| Reliving | 5.54 | (1.19) | 4.92 | (.99) | 1.52 | 5.21 | (1.04) | 3.67 | (1.02) | 3.47* |
| Remember | 5.96 | (.87) | 5.77 | (.51) | .47 | 6.33 | (.97) | 4.55 | (1.37) | 4.3** |
| Go Back | 5.29 | (1.02) | 4.95 | (1.20) | .63 | 4.71 | (1.32) | 3.62 | (1.50) | 3.3* |
| | | | | | Imagery & Emotion | | | | | |
| Hear | 4.83 | (1.49) | 4.68 | (1.45) | .21 | 4.79 | (1.45) | 3.67 | (1.25) | 1.41 |
| See | 6.13 | (.77) | 5.58 | (.81) | 1.93 | 5.67 | (.89) | 4.06 | (1.12) | 2.9* |
| Setting | 6.21 | (.75) | 5.97 | (.41) | 1.69 | 4.83 | (.85) | 3.67 | (.82) | 3.8* |
| Spatial Layout | 4.83 | (.88) | 4.78 | (.89) | .12 | 4.25 | (.99) | 3.87 | (.99) | 1.3 |
| Emotion | 5.21 | (1.17) | 5.17 | (.41) | 2.4* | 5.17 | 1.37) | 3.20 | (.70) | 8.4*** |
| | | | | | Language and Narrative | | | | | |
| Talking | 4.79 | (1.34) | 4.76 | (1.21) | .04 | 4.83 | (1.37) | 3.50 | (1.15) | 3.2* |
| In Words | 4.50 | (1.88) | 4.05 | (1.89) | .86 | 4.38 | (2.42) | 2.58 | (1.28) | 4.2** |
| Coherent Story | 5.13 | (1.11) | 5.03 | (1.12) | .15 | 5.21 | (1.07) | 4.22 | (1.08) | 1.65 |
| Significant | 4.38 | (1.16) | 4.57 | (.97) | -.41 | 5.08 | (1.60) | 3.12 | (.91) | 3.1* |
| Occurred | 6.17 | (.75) | 6.16 | (1.09) | .01 | 6.00 | (.70) | 4.56 | (1.39) | 4.1** |
| Recalled Thought event | 4.75 | (1.41) | 4.53 | (1.11) | .44 | 4.92 | (1.04) | 3.57 | (1.10) | 3.5** |
| Talked twin | 3.83 | (1.86) | 3.64 | (1.98) | .49 | 4.08 | (1.78) | 2.74 | (1.19) | 1.56 |

Notes: Results of a two-tailed t-test, df = 11, are shown * p < .05; ** p < .01; *** p <.001. All variables measured on a scale from 1 to 7 where 7 denotes more of the quality.

Examination of the means suggests that, in general, the ratings of the disputed memories remained relatively stable over the two-year period, with a mean difference between test and re-test of .14 (t = 1.78, df = 5, n.s.) whilst the ratings of the non-disputed memories were significantly lower on re-test, with a mean difference between ratings of 1.33 (t = 9.51, df = 5, p < .001).

Presented below are a series of graphs show each twin sets' mean ratings for those scales that showed significant differences between test and re-test for both disputed and non-disputed memories. T-test values and a brief explanation of each of the graphs are discussed in at the end of section 6.2.

**Figure 6.2 Mean ratings of disputed and non-disputed memories on test and re-test on the reliving scale for six sets of twins.**

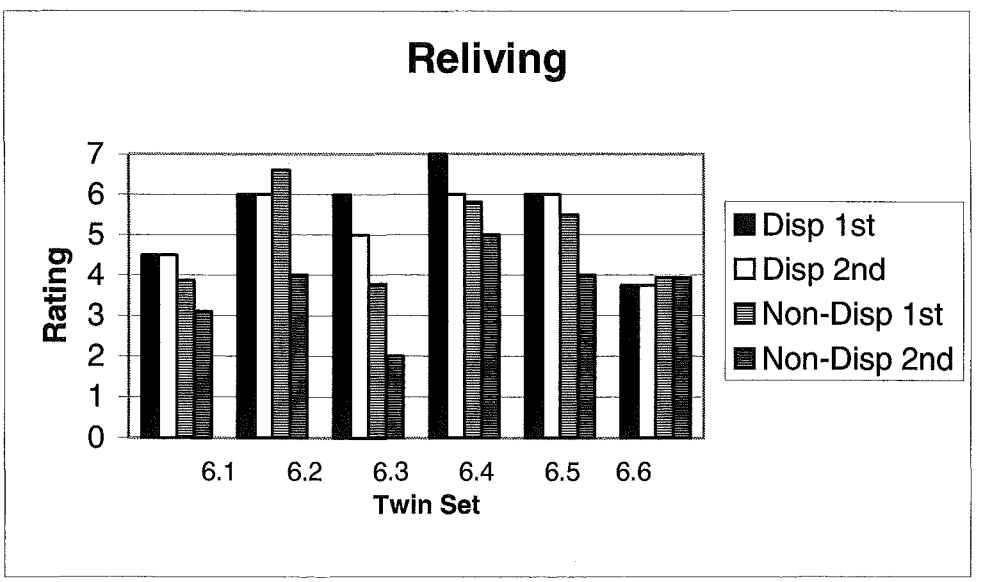


**Figure 6.3. Mean ratings of disputed and non-disputed memories on test and re-test on the visual imagery scale for six sets of twins**

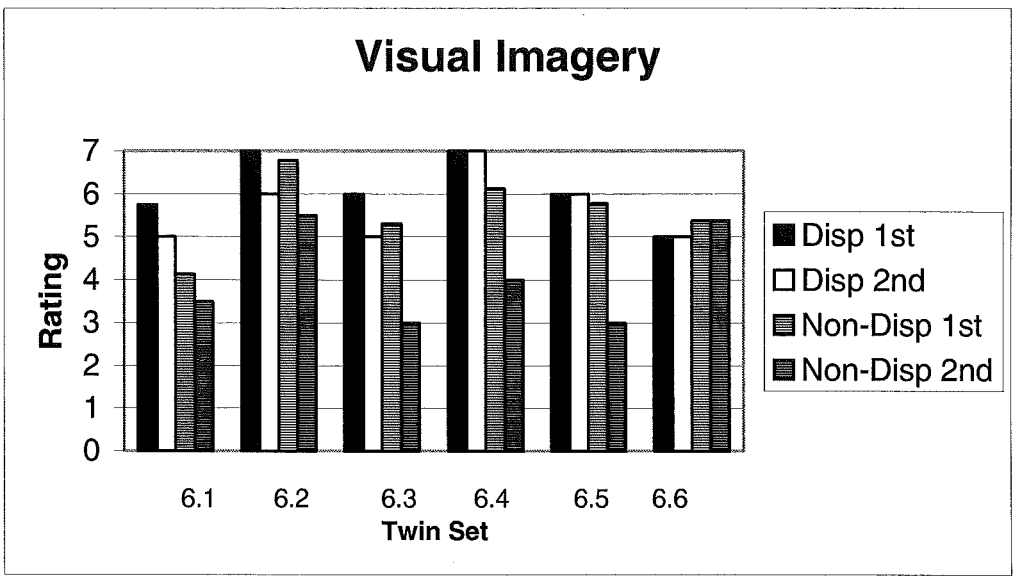



**Figure 6.4. Mean ratings of disputed and non-disputed memories on test and re-test on the talking in memory scale for six sets of twins**

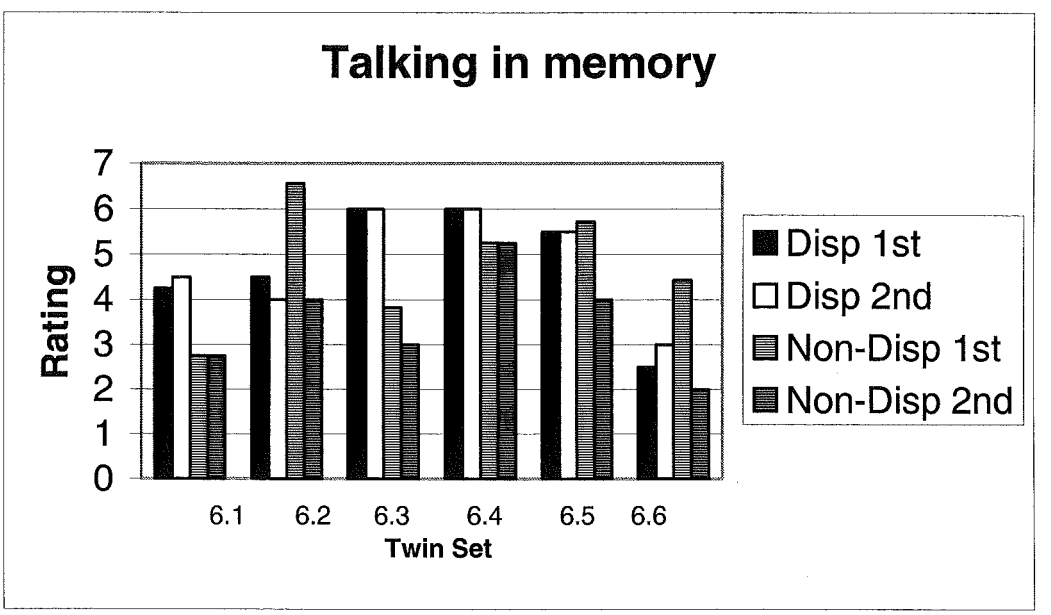


**Figure 6.5 Mean ratings of disputed and non-disputed memories on test and re-test on the emotional reliving scale for six sets of twins**

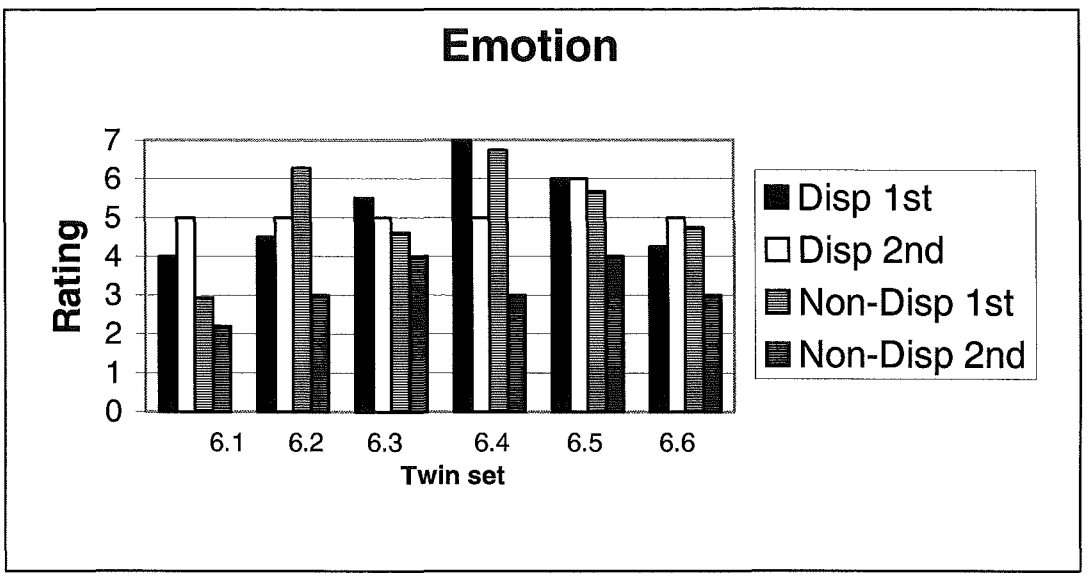
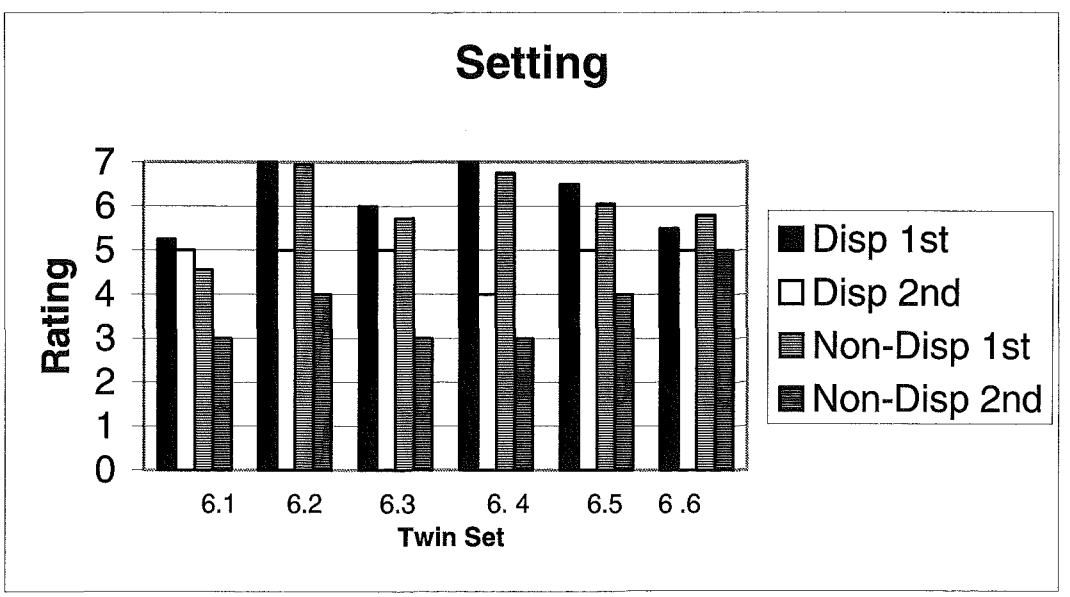



**Figure 6.6 Mean ratings of disputed and non-disputed ratings on test and re-test on the setting scale for six sets of twins**



The data clearly indicate that ratings of disputed memories remain more stable than ratings of non-disputed memories on all of the scales. Figure 6.2, on the reliving scale, visually represents this with ratings of disputed memories staying virtually constant, with a mean difference between ratings of disputed memories on test and re-test of 0.33 ($t = 1.58$, $df = 5$, n.s.). In contrast, ratings of non-disputed memories displayed significant difference over the same period, with a mean difference in ratings of 1.25 ($t = 3.35$, $df = 5$, $p < .05$). The data would suggest that non-disputed memories, when recalled through a sense of reliving, are more likely to become less vivid, whilst disputed memories are likely to retain, or even increase, their sense of vividness.

Significant differences on the visual imagery scale were found in Study 1 between disputed and non-disputed memories and, as shown in figure 6.3, these differences were maintained on re-test. Further, within-memory test and re-test ratings on the visual imagery scale show little difference between disputed memories with a mean difference of 0.46 ($t = 2.20$, $df = 5$, n.s.) but a significant mean difference between non-disputed memories on re-test of 1.52 ($t = 3.48$, $df, 5$, $p < .05$).

Figure 6.4 shows on the talking in memory scale that, despite the small mean rise on re-test, there was little difference between the way the participants rated their disputed memories. For disputed memories there was a mean difference of -.04 ($t = -.31$, $df = 5$, n.s.). Mean ratings for non-disputed were significantly lower on re-test with a difference of 1.26 ($t = 2.67$, $df = 5$, $p < .05$).

Three sets of twins rated their disputed memories higher on retest for the emotion scale shown in Figure 6.5. The other three rated them very similarly with a mean difference in ratings on test and re-test of disputed memories of .04 and a mean difference in ratings on test and re-test of non-disputed memories of 1.97 ($t = 3.72$, $df = 5$, $p < .01$).

The final graph (Figure 6.6) shows participants' ratings on the setting scale. Differences in memory type on original testing showed significant differences between disputed and non-disputed memories and this difference was maintained on re-test. Ratings on re-test for the setting scale fell more than any other scale for both memory

types with a mean difference in test re-retest ratings of 1.38 for disputed memories ($t = 3.30$, $df = 5$, $p < 0.05$) and 2.31 for non-disputed memories ($t = 5.37$, $df = 5$, $p < .01$). .

The final analysis conducted on the data was on the overall differences between disputed and non-disputed memories. All the data was used in this analysis and compared ratings on all of the participants disputed memories (test and re-test) to all their ratings of non-disputed memories (test and re-test). The participants' mean rating of their disputed memories was 5.10 and 4.30 for their non-disputed memories. T-test analysis showed the difference of .08 was significant at the $p < .001$ level ($t = 8.20$, df, 189, $p < .001$).

**6.2 Discussion**

Study 5 indicates that a distinction can be made between the memorability of these two memory types. Ratings of disputed memories were generally stable on re-test unlike ratings for non-disputed memories which were significantly lower. It is possible that past disagreements over the disputed events inflated the ratings, certainly as the data indicate, disputed events are talked and thought about more. It seems unlikely, however, that this accounts for the marked differences between the memory types alone. The data presented above suggest that disputed memories may have some quality that makes them less susceptible to change over time. It is not, however, clear what that quality, apart from rehearsal, might be. One surprising aspect of the data is that the disputed memories tended to be older than the non-disputed memories in that participants had a mean age of 7.4 when the disputed events took place and a mean age of 12.3 when the non-disputed events occurred. Given that there is basic agreement in the literature that older memories are more difficult to recall, it could be argued that some normal processes of forgetting may not apply to disputed memories.

The enduring memorability of the disputed memories coupled with the stability in ratings over a two-year period across all scales indicates that disputed memories are somewhat different from other kinds of shared autobiographical memories in twins. This leads to the question of whether or not disputed memories belong to a special class of memories such as flashbulb or vivid memories. The following chapter will endeavour to

define what disputed memories are and how they fit into existing theories of autobiographical memory.

# CHAPTER 7

# Discussion

## 7.1 Introduction

The primary goal of the research conducted for this dissertation was to investigate disputed memories in twins. Anecdotal evidence had previously suggested that such memories did, in fact, exist and the findings from the studies which constitute the core of this research confirm that evidence and indicate that disputed memories do actually occur in the recollections of many twins. This conclusion is afforded added weight by the fact that in spite of major shifts in the methodology all of the studies produced evidence of disputed memories. Study 1 compared participants' ratings of disputed and non-disputed memories and found that disputed memories were rated significantly higher on the following component processes of mental experience that are central to autobiographical memory: reliving, remember the event, go back in time, auditory and visual imagery, setting, spatial layout, emotional reliving, talking in event, in words, significance of event, confidence and rehearsal. Study 1 also showed that female twins were significantly more likely to report having experienced a disputed memory.

Study 2 employed the cue-word technique in an attempt to elicit disputed memories in a naturalistic way and to control for any effect demand characteristics may have had in Study 1. Fourteen sets of twins reported thirty-six disputed memories and twenty-one of those memories were only discovered to be in dispute during the study. Study 3 asked whether non-twins would also report incidents of disputed memories and found that they do, but at a much lower rate than twins. Six of the sixty-nine participants reported a disputed memory. Study 4 asked parents to supply events from the lives of their twins. These events were then presented to the twins in an attempt to examine how accurately the twins could assign ownership of individual and shared events and whether any of the participants would claim events belonging to their twin as their own. The results suggest that they sometimes do, with two disputed memories reported from six

sets of twins, but the method proved to be somewhat unreliable as the participants' parents often misattributed their twins' events. Study 5 asked six sets of twins who took part in Study 1 to re-rate disputed and non-disputed memories after a two-year delay. The results indicated that the qualities of disputed memories appear to be particularly enduring as ratings for those memories remained stable whilst ratings for non-disputed memories changed significantly on re-test. Overall, the results suggest that many of the qualities of non-disputed memories were not recalled as vividly as disputed memories after a two year time period.

The five studies conducted for this dissertation were thus each successful in eliciting or providing information about a new type of memory phenomenon: disputed memories. This suggests that disputed memories may be a reliable type of memory error that is open to empirical investigation. However, there is a need to establish the nature of disputed memories, the extent to which they differ from non-disputed memories, the factors involved in their creation and the features which render twins more susceptible to experiencing disputed memories than other sets of the population such as close-siblings. This chapter will focus on considering these questions and attempt to situate this new false memory phenomenon within existing theories of autobiographical memory.

## 7.2 Overview

At the beginning of this research it was expected that some striking feature of disputed memories would emerge enabling an identification of the kinds of memories that would likely be disputed. This, however, was not the case. The disputed memories tended to be over typical events that could be expected to happen to anyone living in the Western world. This is illustrated by the similarity between the disputes of the participants across each of the five studies. Disputed memories, for example, concerned such events as spilling drinks, falling off bicycles, getting stung by insects and being sick. What makes these events unique is simply the fact that their ownership is disputed. Given that many of the disputes were over rather ordinary occurrences one could argue that some of the events may actually have happened to both twins at different times. Whilst it is acknowledged that this may have been a possibility in a few cases, the agreement

between the twins over the peripheral details surrounding the disputed memory suggested that, as the twins themselves believed, they were referring to the same event.

Although many of the disputed memories reported during this research may have been over what could be considered trivial matters, most of the participants agreed that the fact the memory was disputed was not trivial. Autobiographical memories serve many purposes. Included amongst these is that they provide a consistent sense of self which tie us to both our personal histories. Consequently, to have someone *take away* something you thought was yours can be a disconcerting and frustrating experience. Thus it is unsurprising to find, over and over again, that whilst they were aware that one of them had an erroneous memory of the disputed event, neither of the twins was willing to concede that his or hers was the *false* memory. As previous research in autobiographical memory has shown, they are unwilling to "give up" their autobiographical memories, considering them to be accurate accounts of past experiences (Neisser & Harsch, 1992). This is also reflected in the higher ratings the participants assigned to disputed memories on scales such as visual imagery and reliving, both of which have been defined as central components of autobiographical memory (Rubin, 1998). It is not yet clear, however, whether the disputes themselves caused the higher ratings for disputed memories. Do disputed memories receive higher imagery ratings because memories that are more easily "seen in one's mind" are more likely to be disputed? Or do the disputes that the twins have had lead to more imagery, possibly as part of the process of asserting one's ownership, or possibly in an attempt to convince the interviewer that they are the *true* owner of the memory.

In the cue-word study many new disputes were discovered *during* the study. As shown in the transcripts of the disputes in Chapter 3, when a memory was discovered to be in dispute, there was often a lively exchange between the twins with both participants providing supplementary information in an attempt to establish ownership of the memory. For example, one set of twins disputed a memory in which one of them was asked to perform a diving display during a school fete. Both twins clearly had a personal recollection of this event, as illustrated by the detail they provided - one in recollecting the circumstances giving rise to the event, the other detailing the emotions accompanying

it. One of the twins gave an explanation as to why it was she instead of her sister who was chosen. She claimed that the teacher had mistaken her hobby of scuba diving for platform diving leading the teacher to ask her to perform a dive. Her twin, on the other hand, reported that she vividly recalled how high the platform had been and how scared she was when she performed the dive. The interaction between the twins during the cue-word study provides a platform from which to view the quantitative data collected in Studies 1 and 5. During the cue-word study the twins often used such phrases as: "I know it was me; I can see it in my mind" or "I am sure it was me because I remember being really angry". Content analysis of the transcripts is in accordance with such anecdotal evidence. The twins used more words when talking about the disputed memories, they used more possessive and personal pronouns and they used more words associated with emotion as if they were trying to establish their ownership of the event.

Study 5 was concerned with examining whether the higher ratings for disputed memories reported in Study 1 would be maintained after a two-year time period. As reported the mean ratings for disputed memories on all of the scales remained stable whereas ratings for non-disputed memories changed quite significantly over the same time. For example, disputed memory ratings on the emotional reliving scale were 5.21 and 5.17 on test and re-test. Conversely, non-disputed ratings for the same scale were 5.17 and 3.20 on test and re-test. Clearly a high level of emotion is persistently associated with the disputed memories despite the fact that the original ratings on the personal significance of the disputed events were relatively low. Indeed, mean disputed memory ratings on the personal significance scale went up from 4.38 to 4.57 on re-test. This rather unusual result suggests that the high emotion ratings for disputed memories may not be associated with the actual event or memory itself but with the fact that the event is *disputed.*

### 7.3 Characteristics of disputed memories

A total of seventy-seven disputed memories were reported from the four studies that elicited memories from participants. Fifty-six of those memories were known to be in dispute prior to the studies and apparently could not be resolved by a third person or

witness to the event. This, however, is not surprising given the difficulty the parents had in attributing the correct event to their twins in Study 4.

Overall the disputed memories tended to be over either negative or neutral events. Of the seventy-seven disputes forty-five of them were over negative events, twenty-six were over neutral events and six concerned positive events. The participants saw themselves as the protagonist in the event in sixty-one of the disputed memories, further in forty-three of the disputed events the protagonist was portrayed as a victim. For example, Twins 2.16 were fifty-four years old when they took part in the cue-word study but still vehemently dispute which one of them was not invited to a birthday party when they were ten years old. It is clear from the transcripts of this dispute that they both still harbour some ill feeling toward each other for leaving the other at home. Indeed both of them took the moral high ground by claiming that they would never have attended the birthday party had the other not been invited. This is a good example of Robinson's (1996) theory that a person's current mood can guide exactly what and how something is remembered. In this case perhaps the twin who actually went to the party subsequently felt guilty for leaving her twin behind and reconstructed the memory, portraying herself as victim, in order to have a more comfortable recollection

### 7.4 Affect

There has been much debate as to whether people can remember prior feelings directly (Forgas, Bower & Krantz, 1984; Forgas & Bower, 1987; Robinson, 1996) and how accurate those recollections are (Brown & Kulik, 1977; Linton, 1982; Wagenaar, 1986). As discussed by Robinson (1966) there are two main approaches to the study of affect and autobiographical memory. The first, a cognitive approach was first put forward by Ross in 1990. He suggested that because the majority of people's memories are neutral, any affect related information associated with a memory is encoded as part of the overall cognitive representation (p. 194) and not embedded in the memory record per se. This approach takes the view that emotions are not revived automatically but reconstructed using information that was encoded as part of the overall memory representation. In discussing this theory, Robinson (1996) suggested that people encode and retrieve information available to them in a selective manner. Robinson suggested that

the recall of affect was an interactive process between information derived from the overall memory representation and a person's current needs and goals If, for example, a particularly happy memory was remembered then recalling details of the event would stimulate behavioral reactions such as a feeling of happiness or euphoria. Thus, Robinson claimed, "memories start phenomenologically cold but can become hot through cognitive reconstruction" (Robinson, 1996, p. 204).

The second approach proposed by first put forth by Christianson (1992) is more multi faceted and, one could argue, better reflects the complex ways in which we remember the past. Christianson, as well as others (Johnson & Multhaup, 1992), put forward a multi-system explanation for the recollection of emotion. In this view, the interaction between emotion and cognition is complex and can be accounted for by a series of subsystems within the overall cognitive architecture. The multi-system approach is useful because it can accommodate the fact that people remember emotions in many different ways. A person may know how he or she felt at the time an event took place, for example, but may not re-experience those feelings, an observation originally made by St. Augustine in The Confessions. Indeed, it would be most exhausting if memories were accompanied by the emotions originally experienced at the time of encoding each time they were accessed. Robinson (1996) suggested that emotions are elicited in three different ways; as spontaneous affect i.e., when feelings accompany a memory spontaneously, cognitively generated affect i.e., when information is accessed through inferences from the pattern of activities represented in the memory record, or as implicit memory i.e., memories that come unbidden. He suggests that the difference between the multi-system approach and the cognitive approach outlined above is that the multi-system approach provides a better explanation for the processes involved in the recollection of spontaneous affect and implicit memory. Both approaches, the cognitive and multi-system approach acknowledge that affect is cognitively reconstructed.

Which of these two approaches offers the best explanation for the emotion associated with disputed memories? During the cue-word study the twins often "fed off" each other. In some cases they built the memory record together until a full picture of the event emerged and the emotions surrounding the event were reconstructed rather slowly.

For example, despite the fact they knew immediately that the memory was in dispute, the twins would often construct a narrative of the event together, using inferences and supplementary memories and only then, once the memory construction was complete, would they use words associated with emotion as either proof that the memory was theirs or indignation that the memory was actually disputed. At other times, when a word appeared to cue the same memory immediately in both participants, the emotion associated with the event appeared to be generated spontaneously with little conscious effort. This was demonstrated by their first utterances that were often associated with resentment or anger with each other over the fact that their memory was disputed. The cognitive approach outlined above can not account for instances such as this and it would therefore seem that the multi-system approach may offer a better explanation for affect associated with disputed memories.

### 7.5 Point of View of Recall

As noted by Belli and Loftus (1996, p. 206) research on the cognitive control of emotions during recall has shown that elements of *what* is recalled can be manipulated by changing the focus of recall. Nigro and Neisser's 1983 study suggested that highly emotional or vivid memories were usually recalled from the field perspective and that older memories were recollected from the observer perspective. One caveat to their general finding was that situations involving a high level of self-awareness were often recalled from the observer perspective. Given that an event is necessarily experienced from the field perspective, it is not clear when these memories undergo reconstruction. For example, if one were giving a speech, Nigro and Neisser suggested that the memory, due to the high level of self-awareness involved in such an activity, would likely be encoded and recalled from the observer perspective. Belli and Loftus (1996) point out that Robinson and Swanson (1993) found similar results to Nigro and Neisser. Swanson and Robinson compared ratings of experienced affect for events that were first recalled from one perspective and then, weeks later, from either the same or a different perspective. The results suggested that changing the remembering led to differences in both the amount and type of information that was recalled. This led them to propose that different perspectives guide the reconstruction of past events in different ways. The adoption of an observer perspective, for example, leads to a decrease in the amount of

affect-related information recalled and vice versa. Support for this is derived from the fact that traumatic and flashbulb memories are recalled from the field perspective and are very resistant to restructuring (Nigro & Neisser, 1983; Robinson, 1996).

Participants in three of the studies were questioned about the point of view from which they recollected events. In Study 1, seventy-four per cent of disputed memories and sixty-four per cent of the non-disputed memories were recalled from the field perspective. This result suggests that disputed memories tended to be more vivid than non-disputed memories. Nigro and Neisser (1983) suggested that field memories usually change to observer memories with the passing of time. For the disputed memories reported in Study 1, however, half of the sample would necessarily have experienced the event from the observer perspective, suggesting that the shift in perspective can occur either way, for example, events originally experienced from the observer perspective can subsequently be recalled from the field perspective and vice versa.

From the literature on point of view, it was expected that the twin to whom the event occurred would be more likely to recall the event from the field perspective than their twin. This, however, was not always the case as many of the participants in Study 4 reported their twins' events from the field perspective and their own events from the observer perspective. The point of view distinction is usually used to assess whether someone recalls an event from their own eyes, as they would have originally experienced the event, or from an observer's point of view, as they would have viewed the event as a spectator. In the studies presented here, where participants were asked to report on the point of view (Studies 1, 4 and 5), both co-twins were present when most of the events occurred. Thus, asking Twin A to report on the perspective from which he recalled an event which happened to Twin B does not allow for that the fact that if Twin A has his own independent recollection of the event and is, therefore, reporting from his own perspective and not necessarily the perspective of the protagonist. I would suggest that this accounts for the wide variance in the perspectives the participants reported for their own and their twins' memories.

## 7.6 Confidence and Accuracy

One area that is of particular relevance to this research concerns the imagery associated with recollection. Imagery has been shown to be a central component of the experience of reliving when remembering events. People frequently report visual imagery in support of the veracity of their recollection, arguing that because they "can see it as plain as day" they must be correctly recalling the event. In Studies 1 and 5 participants rated the levels of imagery higher for disputed memories than they did for non-disputed memories despite the fact that the disputed event only happened to one of them. The imagery ratings for disputed memories also remained much more stable after a two-year period (6.13 and 5.58 on test and re-test) than they did for non-disputed memories after a two-year period (5.67 and 4.06 on test and re-test). It could be argued that the higher ratings for disputed memories are merely a reflection of the twins' attempts to convince themselves (or the interviewer) that the memory is indeed theirs. It could further be argued that the methodology was partly to blame for the higher ratings for disputed memories. It seems unlikely, however, that these account solely for the higher ratings and it also does not explain why ratings on certain scales, indeed scales that are central to theories of recollection, show significant differences while other ratings do not. It could, therefore, be argued that the imagery associated with disputed memories may have more of an enduring quality than imagery associated with non-disputed memories.

During the cue-word study the participants often cited examples of being able to see the memory as proof that the memory was theirs. In one case, for example, both twins agreed that only one of them was at a restaurant with their mother when she had to send her food back to the kitchen because her meal had a worm in it. In this case, Twin 2.1.1 claimed to "distinctly remember looking at my plate and seeing a worm" to which Twin 2.1.2 responded by giving background information; "I was sick so I went shopping with her; it was a school day, and I was home and mum didn't have anyone to look after me, and she was a shopaholic, so she thought she would take me with her". Twin 2.1.1 retorted "You might have all these details but I am sure it was me, coz like I remember like seeing the worm".

In hearing these two accounts of the same story, a lay person would be hard-pressed to decide which person is telling the "truth". Does one believe supplementary information or irrelevant detail, such as the whys and wherefores, or does one take the report of visual imagery as a valid indicator as to whom the event legitimately belongs? The literature suggests that both types of details are used by people to assess the accuracy of memory accounts but there is no available data which distinguishes which is more reliable.

An erroneous construction of visual imagery might be more likely if one were, in some way, motivated to claim a particular event as his or her own. Let us return to the example just given where the twins disagreed as to which of them went to lunch with their mother. It was unusual for either one of them to be alone with their mother and this particular incident was all the more unusual because one of them was ill and stayed home from school. Being taken out for lunch by their mother on this occasion was considered to be a real treat, not just because it meant a day off school, but because it was a rare moment that she had her mother's undivided attention. The literature on twins is rife with examples of twin rivalry (Nairn, 1994) and one can see how, in this case, the motivation to believe that she were indeed the one who had lunch with her mother, could lead one of them to adopt a version of the event with herself as the protagonist.

In studies 1, 4 and 5 participants were asked to rate their disputed memories and these were compared to ratings of their non-disputed memories on a number of scales used to measure phenomenological properties of autobiographical memory. Mean ratings for disputed memories were higher than they were for non-disputed memories on scales such as visual imagery, auditory imagery, reliving, belief the event occurred as it was remembered, and rehearsal. Given that one of the twins has an erroneous memory of the event it appears that the "false" memories share the same phenomenological characteristics as "true" memories. Indeed the confidence the participants had in their disputed memories suggests that they have both a conscious awareness and supporting memories for an event that was never personally experienced. In their study on confidence judgments Bransford and Franks, (1971), found that people often reported high levels of confidence in their false memories. Holmes, Waters and Rajaram (1998)

suggested that the possibility that false memories could be rated with *remember* judgments indicates that these memories can have false episodic content. Research on reality monitoring suggests that real memories have, on average, more contextual and sensory detail and supporting memories than memory for imagined events. Reality monitoring theory also predicts that if a person truly believed a memory to be accurate it should have the phenomenological characteristics of actually-perceived events. Holmes, Waters and Rajaram (1998), however, claim that this is only one of a number of possible interpretations. They suggest that when people fail to accurately monitor the source of their memories they are more likely to accept an imagined event as one they had actually experience In the case of disputed memories, either of these interpretations could suggest possible causes for the strong beliefs that the twins often had in their "false" memories.

### 7.7 Source Monitoring and Source Misattributions

One line of research in autobiographical memory that has implications for the study of disputed memories is on source monitoring. As previously discussed in Chapter 1, source monitoring refers to the process by which people recall when, where and how a memory was acquired. Source monitoring failures have been implicated in many kinds of memory errors such as the misinformation effect and recognition of famous and non-famous names (Jacoby, Kelley, Brown & Jasechko, 1989). In the case of disputed memories in twins, two possible routes to source monitoring failure exist, one within the twins themselves by adopting each other's memories and the other via their parents or significant others in their lives who may unintentionally implant a false memory through misidentification.

The German poet Goethe once remarked that "when we try to remember what happened to us in early childhood we often confuse what others have told us with our own directly perceived experiences" (cited in Freud's Collected Papers, 1917, p. 64). Similarly, Loftus once commented that "misinformation has the potential for invading our memories when we talk to other people (Loftus, 1997, p. 72). These two quotes may help in understanding the results of Study 4. As reported many of the parents of participants who took part in this study had great difficult in correctly assigning individual events to each of their twins. One of the mothers went so far as to claim that

she did not see her daughters as individuals but as "the twins". This particular mother went on to incorrectly attribute four out of the ten events to the wrong twin. If these misattributions are typical, then it would seem reasonable to expect that some of the disputed memories might have been falsely implanted in the participants by their parents. Narratives are created through social interaction and as parents frequently talk about their children's exploits with others it is conceivable that, when discussing an event with other people or during parent-child interactions, a parent could confuse the twins and incorrectly identify the protagonist in a particular event. The person may later incorporate this version of the event into her memory then and claim the memory as her own. This is particularly likely given that research has shown that realization judgments are not well developed until late childhood, a period from which many of the disputed memories are derived. Compared to older children and adults, younger children are more prone to errors at distinguishing between real and imagined events (Schacter, 1995). Recent work on the source monitoring framework suggests that children find it particularly difficult to separate sources of information that are perceptually and semantically similar (Johnson, et al, 1988; Schacter, 1995,).

Recent work on cross-modal source monitoring confusions (Henkel, Franklin & Johnson, 2000) could provide some insight into how some disputed memories may be created. This line of research is concerned with circumstances where participants experience an event but become confused as to the origin of the modality in which it was originally perceived. In one condition, for example, participants are asked to imagine an event, for instance, a basketball bouncing or a toilet flushing and then, after an appropriate time delay, the same participants are asked to listen to the sound that event would make. Other conditions include imagining the same event twice, and imagining hearing an event and then subsequently seeing it. Henkel et al. found that the condition that elicited the most false memories was the "imagined as seen and actually heard" condition. They reasoned that, upon hearing a sound, most people *automatically* conjure up a visual image associated with the noise. Because the image is unconsciously created people do not monitor the source of the 'memory' and assume it was actually visually perceived. This, coupled with having imagined seeing the event creates a visual image

that is strong enough to lead the participants to declare they have actually seen, in this case, the basketball bouncing.

Cross modality source confusions could be of possible relevance to the study of disputed memories. For example, in the case of twins there would be many instances of one of them listening to a story about the other and coming up with a visual image of the event and later confusing that image as having actually been perceived. For example, twins 2.1 disagreed as to which of them performed a dive from a platform. One can well imagine the circumstances where one twin was busy describing how high the diving board had seemed when she got up there to do the dive and other was busy imagining it. It is not, however, clear whether this would necessarily fall under the banner of cross modality confusions. In their experiments Henkel et al. (2000) had participants listen to an actual ball bouncing. It would have been interesting if another condition included the participants hearing someone talking about a bouncing ball. If they went on to form a visual image or, hearing about the ball led them to a greater belief that they had in fact perceived a bouncing ball, then this would reflect one of the ways a disputed memory is generated. Indeed, Belli, Lindsay, Gales and McCarthy (1994) found that when participants read a description of something they tended to misattribute the source and report having seen the event. It would therefore seem fair to conclude that research into cross modality confusions could well provide a way of understanding possible routes to the generation of disputed memories, but research is required in both areas before firm conclusions can be drawn.

### 7.8 A Cognitive Explanation

In the case of twins, one could argue that the conditions for the creation of false memories are ideal. After all, if an event could happen to one twin it could usually happen to the other. As discussed in Chapter 1, Hyman (1999) suggested that three cognitive processes are involved in the process of creating of false memories: event acceptance, imagery/narrative creation and a source monitoring error. He argues firstly that an event has to be deemed plausible for it to be accepted as a possible memory. Secondly, an image or narrative has to be formed. People often combine schematic

knowledge with personal experiences and current demands in order to construct an image or narrative of the event, and tying the event to self-knowledge, for example, makes false memory construction more likely. Lastly, a source monitoring error must be made. In the case of disputed memories in twins, it could be argued that the first two cognitive processes take place automatically and thereby make twins more susceptible to disputed memories. For example, the event surrounding the disputed memory *has* occurred and, therefore, event acceptance is automatic. A narrative or image has been created, either by both being present at the time the event took place or by hearing details of the event being told to someone else. It is also possible that the twin with the non-veridical recollection of the event heard someone else tell the story who confused their identity. This misinformation could lead to one of the twins making a source monitoring error and later to claim the memory as their own.

### 7.9 Unconscious Plagiarism

One way of viewing disputed memories is to consider them as a form of unconscious plagiarism, or cryptomnesia. The study of cryptomnesia typically introduces material to participants in an encoding session in the form of experimenter-provided examples or from fellow participants and later, after participants are warned not to use information derived from these examples, they are asked to generate novel ideas. In their work in this area, Bink, Marsh, Hicks and Howard (1999) found that, when participants were asked to produce four novel ideas, on for example how to reduce traffic accidents, they tended to plagiarise previously encountered ideas. Further, they found this effect to be more robust when the original ideas were gleaned from credible sources such as, in this case, town planners. They suggested that the reasons behind the tendency for people to claim others' ideas as their own novel thoughts can be placed within the source monitoring framework. Johnson et al., (1993), also used this framework to explain some instances of unconscious plagiarism. They suggested that these errors can arise when attention is divided to the extent that people can not completely pay attention to their surroundings and therefore do not encode those details. For example they may not have been completely aware that they heard someone discuss ways to reduce traffic because their attention was divided. Thus, when a memory about that very idea is accessed, without information about its source, it is treated as a novel idea.

The mechanisms associated with cryptomnesia could be usefully applied to the phenomenon under investigation here. Conversations involve taking turns (in ideal circumstances!) and this is particularly true when stories about the past are being told. One person's story about a high school dance cues the next person's memory about the time a car broke down on the way to their graduation ball, and so on and so forth. In the case of twins, two possible routes to unconscious plagiarism might exist. First, in line with the research mentioned above, it is possible that an ongoing conversation would cue a spontaneous memory and the twin may be so involved in reconstructing the memory that the demands placed on cognitive processing make the person less able to attend to source monitoring processes and lead them to accept the memory as their own instead of their twin's. Second, in social situations when they are with people other than their twin, and do not have their own particular memory relevant to the ongoing conversation, they use their twin's personal memories, unconsciously or otherwise, as a default memory. After all, if it could have happened to their twin it could just as easily have happened to them.

People not only associate with each other but also with the memories of those close to them (Conway, 1997). In some cases, people also interact with memories of complete strangers. In their study on university students' memories of events from their past, Barclay and Wellman (1986) presented participants with both descriptions of their own events and descriptions of other students' events (foil events). They found that whilst participants could correctly identify up to ninety per cent of their own events, they were not as good at rejecting foil events. Participants claimed up to forty-one per cent of their fellow students' events as their own. If these event misattributions can occur in strangers, it is no wonder that they occur, in the form of disputed memories, to a greater extent in twins.

### 7.10 Self-Schema

Studies on behaviour genetics show that twins tend to assimilate their personalities to a greater degree than siblings do (Plomin, DeFries & McClearn, 1990). Further, twins are not only similar to each other in appearance, they are similar in the way

they interact with their environment (La Buda, Svikis, Dace & Pickens, 1997). In this sense, many twins can be thought to have a shared self-schema. The self-schema is described by Brewer (1986) as a generic cognitive structure containing personal information about such things as attitudes and personal goals. The self-schema is also seen as being dynamic in the sense that it evolves with the passing of time (Bruner & Feldman, 1996) and changes to reflect the way the past is remembered. As Linton (1986, p.64) noted "one can see the internal historian begin to exercise its prerogative – rewriting has begun to occur". If, as is argued here, twins do share a self-schema, it is possible that this, combined with their assimilation of personalities and history of shared experiences, helps to explain the higher frequency of disputed memories in twins than in close siblings.

### 7.11 Imagination Inflation

A number of studies on the power of imagination have demonstrated that imagining the past in a different way than it occurred can change the way it is subsequently remembered. Further, these studies have found some evidence that imagining counter-factual information makes people more confident that the event actually occurred. Garry and Polaschek (2000) suggest that two factors account for this imagination inflation effect. The first is source confusion (Johnson et al., 1993), which Garry and Polaschek suggest involves people confusing genuinely experienced events with events that were only imagined. The second explanation they offer for imagination inflation is familiarity. Imagining an event may make the event seem more familiar thus causing people to incorrectly attribute the increase in familiarity to its actually having occurred. A debate currently exists as to the nature of imagination inflation with some researchers questioning whether the effect is simply an artefact of statistical analysis (Pezdek & Eddy, 2001). At present it seems reasonable to accept that imagination inflation is indeed a reaction to imagining counterfactual information causing people to be confident that false events were personally-experienced events. The imagination inflation paradigm could offer some explanation as to why the twins with the erroneous memory are able to rate the memory on scales such as visual imagery at all. It is possible, indeed likely, that the person who imagined the event was unable to distinguish its source and accept it as a genuine personally-experienced memory.

Although the imagination inflation paradigm offers a good platform from which to view disputed memories it cannot, by itself, explain why twins would be more susceptible to experiencing disputed memories than other sets of the population. I would argue that another factor is also at play, namely the empathetic relationship that the twins themselves share. In their research on the closeness of twins, La Buda, Svikis, Dace and Pickens (1997) suggest that twins share a particular empathy with each other that other siblings do not. The Oxford Advanced Dictionary defines empathy as the "power of projecting oneself into; and so fully understanding and losing one's identity; power of sharing another person's feelings". The empathy that exists between twins would suggest that they would often know how the other would react to any given situation, thus allowing them to adopt a memory with a degree of authenticity. I would argue that the empathetic nature of the relationship twins often share could create such a shared environment that they feel and imagine each other's triumphs and tribulations to the extent that they sometimes can not differentiate who the main actor in the event was. I would also argue that this level of empathy combined with imagination inflation could account for some factors involved in disputed memories. Anecdotal support for this kind of explanation is derived from a personal example I gave during the introduction to the cue-word study in Chapter 3. My own twin and I dispute a memory over a first kiss at summer camp when we were twelve. The boy in question was the "camp catch" and although we both vehemently believe we were the one who was there, the event (one would hope) only happened to one of us. This occasion would have been talked about over and over and described a number of times to our friends. It is therefore very possible that the one of us who was *not* there imagined the event numerous times but with *herself* as protagonist. Upon subsequent recall the source of the memory, imagined or otherwise, becomes indistinguishable and all that is left is a firmly held memory for a past event.

### 7.12 Gender and Disputed Memories

The methodology used in Study 1 was straightforward in that participants were given an example of what a disputed memory was and then asked whether they had ever experienced a similar dispute with their twin. Nine of the forty people who responded to appeals for twins to take part in a study of memory were male. Of those nine male twins only one reported having ever experienced a disputed memory. In Study 2, where the

cue-word technique was employed, three of the four sets of the male twins who took part in that study reported four disputed memories in total. Whilst this difference in findings between the two studies may appear to be uncompelling, in reviewing the qualitative data that emerged from the cue-word study, it is of note that three of the four disputed memories were only discovered to be in dispute *during* the study. In a large scale study of twins, Koch (1966) found evidence that female twins talk to each other more than male twins do. She also found that, compared to female twins, male twins tended to be more withdrawn, subdued and socially apprehensive. Two factors appear to be important in relation to this research and gender differences related to the prevalence of disputed memories. First, because male twins engage in less verbal interaction than female twins, they are less likely to be *aware* that they have any disputes over events from their shared pasts. This is supported by the fact that in Study 1 the male twins reported only one incident of a disputed memory, but in Study 2, where the male twins were required to discuss events from their past, in response to forty cue words, three new disputes and one old dispute were elicited. Thus, when the male twins who took part in the cue-word study were required to talk to each other, they reported as many disputed memories as female twins did. Second, if, as the literature suggests, male twins talk to each other less often and are more withdrawn than female twins, they are less likely to develop an empathetic relationship with each other. As I have argued above, the closeness of this relationship and the inherent ability this closeness affords to empathise with each other, could be a contributing factor to gender differences found during this research.

### 7.13 Replication of Disputed Memory Effects

Support for the suggestion that disputed memories appear to be a reliable type of memory error amongst twins is derived from an unpublished study that set out to replicate the findings of Study 1. Ikier, Tekcan, Guloz and Kuntay (2001) asked thirty sets of same-sex siblings (fifteen of which were monozygotic twins) whether they had ever experienced a disputed memory. They did not give their participants an example of a disputed memory but asked them to respond to two questions: 1. "I remember an event but cannot remember whether it was me or my twin / sibling who had experienced it". 2. "Sometimes my twin / sibling remembers an event that I have experienced as if he or she had experienced it or sometimes I remember an event that my twin / sibling had

experienced as if I have experienced it". They then asked the participants to provide details of any events that were disputed and also asked them to provide non-disputed memories that participants then rated on ratings of importance, rehearsal and imagery. Differing from the results reported in Study 1, they found a robust effect of zygosity on the number of disputed memories reported (63% of monozygotic twins and 33% of dizygotic twins reported at least one disputed memory). However, similar to my Study 3, they found that only a small number of same-sex siblings reported a disputed memory (11% of same-sex siblings). Disputed memories uncovered by these researchers tended to be experienced at a younger age, were rehearsed less than other memories and involved a much lower level of imagery than other memories. The findings of Ikier et al. (2001) support the earlier assertion that disputed memories tend to be of mundane events which participants in their study rated lower on a personal significance scale than other types of memories. Unlike the results reported here, however, Ikier et al. (2001) found that participants' ratings of disputed memories were lower on all the scales they measured, such as importance of the event, imagery and rehearsal, than non-disputed memories.

### 7.14 Limitations of the Research and Possibilities for the Future

One limitation of this research concerns sampling. The twins who took part in this study were recruited via three methods: newspaper advertisements, posters around the university campus and via the local multiple birth club. Thus the twins who responded to the first two methods were either university students or readers of a newspaper and as such could be regarded, to a certain degree, as being educated. It could also be argued that the twins recruited via the multiple birth club came from a particularly nurturing environment, given that their parents ostensibly belong to a parenting club, which may not be representative of the environment shared by all twins. The second factor related to the use of twins as participants is that they represent a small subset of the population making it difficult not only to find a large enough sample but also to find naïve subjects when conducting a series of experiments. A third factor which should be noted is that because twins are often questioned about their lives, they are used to talking about themselves. In this regard they could be considered to be "motivated" participants

who are used to people taking some sort of interest in them and are perhaps particularly aware of themselves and their with their co-twin.

In looking at possible directions future research in disputed memories could take, one might first look at the types of memories that were disputed. They occurred mainly during childhood and early adolescence and tended to be over typical events that were not idiosyncratic to twins. It would, therefore, seem that methods that elicit memories from those lifetime periods would be best employed in the investigation of disputed memories. Further, given that many of the disputed events were over negative or neutral events, one might also target the kinds of events that give rise to those types of memories, for example, by selecting appropriate cue words. Study 3 used a questionnaire method to ask non-twins whether they had experienced disputed memories. Six out of sixty-nine participants reported a disputed memory and in this respect one might therefore usefully employ the cue-word method with close-siblings or friends who have spent a lot of time together. This method could also be used with other sets of the population such as couples who have been married for a long time, provided they were asked to produce memories to cues which occurred when they were both present. For example, if one were using the cue-word technique with married couples who met in their twenties, they would be asked to provide memories to cues from the time they met and not before.

Some of the twins who took part in Study 1 reported frustration that they were unable to recall more than one or two disputed memories despite the fact they said they had experienced many more. One method which might act as a memory prompt, similar to the cue-word, could be to present them with photographs from their past and ask them to provide written descriptions of the events and to provide details such as who the protagonist in the event is. As mentioned in Chapter 1, this method has been used by Burt et al. (1995) who found that people sometimes claimed other participants' events as their own.

### 7.15 Conclusion

At the beginning of the research that is reported here, a search of the literature was carried out to determine whether any studies existed on disputed ownership of

memories in any sets of the population. No such studies were found and it has, therefore, been somewhat difficult to set this new type of memory error neatly into any of the existing theories used to account for errors in recollection. Certainly, the main *ingredient* involved in a disputed memory would seem to be a source monitoring failure on behalf of one of the twins. However, this framework does not adequately explain how the erroneous memory was actually acquired. The misinformation effect, which includes elements of source monitoring failures, was considered in relation to disputed memories but the scope of this paradigm is limited to peripheral details of a memory and as such cannot account for the processes involved in the adoption of someone else's memory. Some elements of the theory on unconscious plagiarism were applied to the study of disputed memories. For example, it was suggested that twins may sometimes unconsciously use their co-twins' memories as a default when no relevant memories of their own were available. It seems to me, however, that the two theories which appear to offer the best platforms from which to begin a systematic study of disputed memories are the cognitive explanation postulated by Hyman (1999) and the imagination effect reported by Garry, Manning, Loftus and Sherman (1996).

The present work contributes to the ongoing effort by social scientists to determine what types conditions give rise to inaccurate memories. This line of research is of particular importance for many reasons. Firstly, our justice system is reliant on the ability of jurors to delineate what factors constitute the truth. Secondly, the upsurge in people reporting false cases of sexual abuse as a result of misguided therapeutic techniques has wreaked havoc on many people's lives. At present there is no foolproof way to tell whether a memory is authentic unless there is evidence to support or negate it. Instead we must rely on the reports people give of their memories. The more we know about false memories the more able we are to set theories in place which will help us to understand what factors are involved in their creation.

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